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ABSTRACT

This study was undertaken to relate Job Corps training outcomes to the costs of training, in terms of human talent, time, and material resources. Training outcomes or benefits were classified according to Job Corps objectives, then compared to total costs incurred by both training center and enrollee. Empirical validation and other evaluation of the procedure proved it to be sound and applicable in a comparison of manpower training programs. The results reversed several conclusions of earlier studies which had considered outcomes only. When costs are included in the analysis, it is no longer true that young or rural corpsmen perform poorly. When heavily oriented placement scales are used as criteria, the superior performance records of black corpsmen is reversed. A detailed presentation of the model is included, along with tables displaying the full results of the analysis. (BH)

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A JOB CORPS STUDY OF RELATIVE COST BENEFITS

VOLUME I AND II

Submitted To:

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A JOB CORPS STUDY OF RELATIVE COST BENEFITS

VOLUME I

Submitted To:

Office of Plans and Programs
Job Corps
Office of Economic Opportunity

By:

Software Systems, Inc.
1660 L Street, N. W.
Washington, D. C.

APRIL 1969

An innovative study using a new approach to Cost Benefits Analysis. Prepared for the Plans and Evaluation Division of Job Corps by Software Systems Inc. under Contract No. OEO 2424.

PREFACE

The Job Corps is a four year old experiment in approaches to training the disadvantaged. Like a multitude of other federal, state, and local programs, it is an innovation in application, if not in concept. Data available to date has confirmed that Job Corps is operationally successful but questions of efficiency and transferability of results are continually raised.

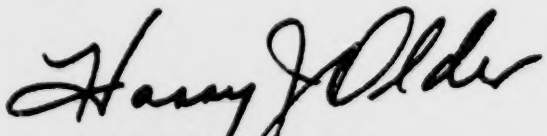
The present study was undertaken in an effort to determine the relationship between the input in the form of human talent, time, and material resources and the resulting training product.

Recognizing the difficulties of benefits analysis for educational and training programs, new methodologies are applied to this investigation. The approach to cost benefit analysis used in this study avoids many of the pitfalls of other approaches. (See Introduction). No technique can be applied without good data sources; here Job Corps, with its extensive information system, provided a great assist.

Job Corps through this effort has taken a courageous step in extending the technology of program evaluation. Typically, innovations in methodology remain in the laboratory until their safeness is determined.

This report is organized into two parts. Volume I is largely a narrative presentation of the study procedures and its findings. Volume II is far more detailed and contains a presentation of the benefits model and its rationale as well as the data tables from which the conclusions presented in Volume I were drawn. This structure was chosen in order to enhance readability, yet present the findings accurately.

Special acknowledgement should be given to Dr. Allen Benn who served both as a technical consultant and project leader. Dr. Benn in cooperation with Gilmore Wheeler, former Chief of Evaluation and Research, was responsible for the development of the technique applied in this investigation. Further, the experience of Dr. William Darnell and Gilmore Wheeler with problems of evaluation in Job Corps contributed to the excellence of this study. Especially to the members of the Plans and Evaluation Division of Job Corps (particularly John Fischer and Mary Anne Hammerel) for their advice and patience, our thanks.



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HIGHLIGHTS

1. Several previously established "betterness" conclusions were reversed when costs per program terminee were considered. Examining only absolute effectiveness, older corpsmen have traditionally proven to do better in Job Corps than younger enrollees (16 and 17 year olds). Similarly youth from large cities have as a group stayed longer in the program and had better placement records. Gary Job Corps Center has proven to be one of the more effective Men's Centers. These three results in particular have been reversed or at least questioned under scrutiny of cost per terminee.

The question underlying all three of these reversals is the relative benefit of a long tenure in Job Corps. In each case, the reversal was a direct result of increased costs resulting from a long time spent in the program.

2. Examining the age phenomenon as a function of type of center indicates that Conservation Centers (small rural men's programs) prove to be more effective with young corpsmen than the larger urban Men's Center programs.

3. As might be expected, the large Men's Centers prove most effective with corpsmen from large cities and metropolitan areas. Similar results are achieved for Women's Centers (generally located in urban areas). Conservation Centers are most effective with rural youth. (All centers prove more cost effective with rural youth a function of length of stay and diminishing benefit?).

4. Regional differences exist, but they appear to be a result of centers located in the region. Job Corps policy is to locate corpsmen in centers near home hence youth are typically enrolled in centers located within their home region.

5. Cost benefit rankings were surprisingly constant across criterion scales. Typically results achieved under the assumptions of one scale replicated when alternative scales were considered.

6. A linear cost model proved sufficient for the analysis. An examination of set up costs, including travel, proved incidental. The cost of transporting a corpsman to and from a center and orienting him/her is very small when compared to the average cost of training.

7. Interesting and confirming results were achieved when corpsmember race was considered. Negro corpsmembers generally performed better in terms of the effectiveness indicators considered. But, when cost effectiveness was examined, centers proved less cost beneficial with Negro youth, when a heavily placement oriented scale was considered, than with white youth. This indicates that even federal or regionally oriented programs have not solved the employment problem for Black terminees. This is confirmed when the results of the non-placement oriented scale are examined. This latter scale indicates that within the program the Negro corpsmembers prove to be a cost-beneficial group.

Each of the highlights treated above are examined in more detail in Section IV of this report.

Section 1

INTRODUCTION

The application of benefits analysis techniques, particularly cost benefits analysis, to the Job Corps training program, is a natural extention of an already existing management system. The basic questions considered in this study are spelled out in the Job Corps program memorandum dated July 1968, and are further referenced in the legislative amendments for 1968. Other questions of focus in this investigation are operationally important; they relate to increasing benefits for the corpsmembers by increasing program efficiency.

Methodology:

The strength of cost benefits analysis in making program decisions depends upon effectively handling the measurement of program benefits. What benefit, value, or weight makes up the numerator of the cost benefit ratio? Most variations in the approach to cost benefits analysis are a direct result of the difficulties encountered in measuring benefits. The technique applied in this investigation was stimulated by the same set of concerns.

The technique can best be explained by a simple example. Suppose that Programs A and B are approaches to training. Assume further that both programs have essentially the same training objectives. The purpose of analysis is to determine whether or not Program A is more effective than Program B. What are the procedures that might be followed in making the comparison? The first step might be the definition of outcome categories for program terminees e.g., graduate, non-graduate, discharge.

If these outcome categories are truly related to program objectives, and it is possible to establish valid values of benefit for each of these categories, then program

benefits can be calculated exactly, and the program comparison problem is solved. Consider the following:

Membership in Category V has a benefit of 25

Membership in Category IV has a benefit of 20

Membership in Category III has a benefit of 15

Membership in Category II has a benefit of 10

Membership in Category I has a benefit of 9

To compare Program A with Program B we multiply the percentage of terminees in each group by the known benefit, or weight assigned to the category. This results in a benefits score for the program. The program which has the greater score is determined to be most beneficial. Suppose the terminees from the programs were distributed across the five categories as follows:

Program A:

CATEGORY				
I	II	III	IV	V
10%	20%	20%	20%	30%

Program B:

CATEGORY				
I	II	III	IV	V
20%	40%	30%	5%	5%

A decision might well be made to choose Program A, as it is the more effective program, based on the following:

Effectiveness of Program A (.10) 0 + (.20) 10 + (.20) 15 + (.20) 20 + (.20) 25 = 14

Effectiveness of Program B (.20) 0 + (.40) 10 + (.30) (15) + (.05) 20 + (.05) 25 = 10.5

Suppose it were also determined that the average cost per trainee in Program A was $200, and that the average cost per trainee in Program B was $100. To examine the program effectiveness in light of costs, a simple benefit to cost ratio could be developed.

The application of this ratio would reverse the "betterness" conclusion reached above. Program A would have a benefit to cost ratio of 14/200 or .070 and Program B would have a benefit to cost ratio of 10.5/100 or .105.

The example above is quite sterile. To bring meaning to the program comparison, two questions which control every cost benefits comparison need to be answered. The first question, "How were the categories defined?", actually means, by what criteria do you assign a terminee to Category III versus Category IV? The second question may be more difficult to answer, "How do you determine the weights which are assigned to the categories.?"

Whether the weights assigned to the categories are based upon educational measures, such as reading gains; economic measures, such as anticipated life time earnings; or less rigorous measures, such as attitudes or good citizenship, the task of determining these values is extremely difficult and open to challenge. By refusing to accept the procedure used to determine weights the critic attacks the roots of the analysis.

Assume that the objectives of the program are to increase earning power and develop good citizenship. If one is willing to assume that both earning power and good citizenship are directly related to reading achievement, then the weight assigned to the categories might be developed directly from an average reading gain, possibly using some form of economic conversion. To do this, historical data would have to be available. In addition, a method of conversion based on economic tables developed for other purposes would be needed.

Alternatively, weights might be determined by a survey of the performance of corpsmen after leaving the program. This longitudinal study could develop weights to be assigned to each category. Once the weights were established, program effectiveness could be determined.

Both of these approaches are limited either by narrowness in scope (everything reduced to reading gain) or by timeliness (three year follow up studies do not help with today's decision). Further, every approach to handling social or citizenship benefits is faced with a problem of measurement. This measurement is necessary to determine valid numerical weights for the categories.

In general, the comparison of different programs suffers from the necessity of needing explicit knowledge of the weights, which correspond to each outcome category. Considering the categories defined above, what are the benefits to be attached to each?

What about the assignment of 14 and 16 to categories III and IV respectively, or perhaps 5 and 50? Economic analyses may suggest dollar weights equal to discounted life time earning gains, such as $5,000 and $10,000. Use of these benefits weights amounts to a conviction of their validity.

Whether it be dollars, a simple linear scale, or some complicated formulation, the problem of determining appropriate benefit weights exists. Whichever scale is chosen, it is subject to attack with the simple argument that the weights should not be 14 and 16 nor 5 and 50, but rather 7 and 9. The argument is simple minded and straight forward. But in fact who is to say?

The present investigation represents the first attempt to apply a newly developed procedure* that goes through the same motions of scale development as described above, yet stops short of requiring numerical weights for the measures of benefit.

This new technique assumes that we cannot determine the benefits to be assigned to each outcome category, and instead assigns dummy numbers such as a, b, c, d and e to the five groups.** It then does a cost benefits comparison of Program A and Program B by placing conditions upon the dummy numbers until it is able to reach a decision.

This process permits the decision maker to analyse the results of the analysis in light of the conditions required. The conditions are much more general than specific weights, since they concern benefit structures rather than the specific numbers.

To illustrate the underlying principle of the new procedure, suppose there were just two program outcomes: success and failure. Failure yields exactly zero benefit; success yields an unknown amount of benefit, call it b. That is, the value attached to being a success is equal to b. Suppose, further, that Program A produces 70% successes at $1000 each and Program B produces 60% successes at $500 each. This means that each participant entering Program A can expect or receive .7 x b benefits at an average cost of $1000; while with Program B yields .6 x b benefits at $500.

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*The underlying mathematical theory is pre ented in Volume II of this report.

**These dummy numbers represent points on a general benefits curve. For a more detailed discussion see the first part of the Results Section--Section III.

The cost benefit index for Program A is .7 x b/1,000 = .0007b and for Program B, .6 x b/500 = .0012b. Although the precise values of these indices is indeterminant since b is unknown, a comparison is still possible. That is, since b has the same value in both indices, it can be ignored, and a comparison made by examining the numbers .0007 and .0012. Since .0012 is greater than .0007, Program B is more cost effective than Program A--even though the value (weight) of being a "success" i.e., b, is unknown.

Further, the amount by which Program B is better than Program A can be determined by dividing .0012 by .0007. In this example, Program B is more cost effective than Program A by almost 2 to 1.

Unfortunately with more than two outcome possiblilties the weights no longer cancel as directly as in the example. Far more advanced algebra is needed to affect similar conclusions. The procedure tests algebraically all possible sets of weights beginning first with no restrictive assumptions on the nature of how the weights relate to one another (are they increasing? are they increasing with positive acceleration?, are they linear?). More and more assumptions are added until, finally, one program can be shown more cost beneficial than the other. At this time the procedure indicates 1) what program is better and 2) the conditions that would have to be applied if the decision-maker chose to act on this information. The most stringent assumption ever required of the decision-maker is that the weights be some multiple of the outcome category number plus an arbitrary number. The arbitrary number may be 1 or 1,000,000, or any other. The decision-maker need not specify which. Therefore actual numerical values for weights need never be specified.

A practical explanation of how one interprets the results of this new technique is given along with live data in the results section; the mathematical relationships which form the basis of the tables presented in that section are included in Volume II.

Outcome Categories:

Job Corps has defined categories of output for its terminees, based on the level of program attainment and amount of time spent in the program. That is, did the corps-member complete a specified program of training, and if not, what were the conditions of termination? This is further modulated by the amount of time spent in pursuit of

these training goals. The time factor is included in an effort to credit the individual with some of the more subjective personal gains such as socialization and development of good personal habits.

While issue might be taken with definition of these center-oriented outcome categories, they do exist and do have logical as well as empirical bases. What is important to this investigation if their existence. There is a second problem in any study of effectiveness: the identification of program objectives and related standards of attainment. We are not concerned here with value of membership in one of these categories, but rather Job Corps' ability to reliably place a terminee in an outcome group.

The primary outcome scale used in this study includes the eight groups defined below. It is these groupings that make up Scale I:

1. Stayed less than 30 days in Center but did not transfer.
2. AWOLS with more than 30 days in Center.
3. Disciplinary discharges with more than 30 days in Center.
4. 31-90 days–voluntary resignations, transfers, medicals.
5. 91-149 days–voluntary resignations, transfers, medicals.
6. 150 days plus–voluntary resignations, transfers, medicals
7. Graduates–job placement not verified.
8. Graduates–job placement verified.

Since the identification of outcome groups is so fundamental to the investigation, it was decided to include an alternative set of definitions which was based on program considerations and placement success. Since placement is an overall program objective which currently is not directly under the control of the Centers, it was decided to include it mainly for validation purposes and comparisons among regions. It is quite appropriate to regional center comparisons, however, since here rests full responsibility for

both the program implementation and placement activity. These groups are defined as follows:*

1. Category III unplaced
2. Category II unplaced
3. Category I unplaced
4. Category III placed
5. Category II placed
6. Category I placed

Outcome scales will be subject to change as more information is obtained and the Job Corps information system becomes more refined. An effort is presently underway in Job Corps to define more precise outcome categories based on specific skills attained.

Summary:

(1) Standards used in developing outcome categories are basically the same standards that Job Corps has been using historically to evaluate programs.

(2) The technique used in this investigation for combining the categories via outcome scales allows for standards measuring different aspects of program impact to be combined.

(3) The technique does not require explicit representation of values of importance weights, or benefits attached to each outcome category.

(4) The technique allows for analysis of the amount of benefit received for dollar spent of any program compared to another.

(5) A secondary outcome scale was developed to validate results stemming from the primary outcome scale.

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*Category I, II, and III referenced here are predefined Job Corps Categories of termination. A category I youth has completed a full training program and is certified by the Center Director. Categories II and III have completed partial programs. Category II terminees have been in the program more than 90 days. Category III terminees have been in the program 90 days or less.

Section II

THE STUDY

The discussion which follows summarizes the procedures involved in this investigation and the rationale behind decisions related to the analyses. For those requiring further clarification, a detailed explanation of how the model works is included in the first part of the Results Section. For those mathematically inclined, a mathematical treatment is provided in Volume II.

Criterion:

As noted in the introduction to this volume, the selection of outcome categories or criterion groups is essential to the analysis which follows. It is important that these categories represent the objectives of the Job Corps program, since they are the basis of the cost benefits comparisons.

The categories selected for this investigation were logically constructed, with the assistance of Job Corps personnel, from definitions presently used by the Job Corps to describe terminees. Length of stay, reason for termination, program based categories, and job placement are presently considered as indicators of program success. The outcome categories developed for this investigation were derived from these same factors. (See discussion of Criterion in Section I.)

Since the definition of these outcome groups is so important, it was decided to use not one scale for the analysis, but rather two scales, each oriented to a different philosophy of program objectives. Scale one is heavily affected by time in program and reason for termination. The second scale considers achievement categories and job placement. The scales are not completely different, but are sufficiently different as to provide sound validation of results.

Cost Data:

Cost data used in this study was developed by the Job Corps finance division and provided to the contractor in a prespecified format. This data, like all other used in the main part of the investigation, was taken from existing Job Corps information sources. Cost of training refined by center or program group was used as the basic input to the cost benefits analyses.

When comparing training success for population groups (e.g., age, size of home town, race, region), cost figures were derived from training costs per man month and the number of months in training achieved by the group under consideration. That is, if the cost per man month for training is $300.00, and an individual remains in the program 6 months, his cost factor is $1,800. Set up costs, transportation, screening, etc., were examined for possible separate treatment in order to remove bias. It was found that they made up a relatively small proportion of the total cost of training, and therefore, were included in the computation of an overall cost factor.*

In summary, center costs are actual costs of operation obtained from the Job Corps data system. These include enrollee expenses as well as operating costs. For comparisons among population groups, derived cost figures, based on length of stay, and predetermined center costs were used.

Cost/Benefit Comparisons:

Several sets of cost benefit comparisons were made for each type of Job Corps center. These comparisons included center by center rankings, sponsor type, placing agent, home region of the enrollee, and center size. Limitations in the data** precluded a planned examination of screener type.

In addition to asking these basic questions, the complete Job Corps information system, which includes over 70 factors, was examined. This was done in an attempt to determine if individual characteristics of corpsmembers might be important as far as cost benefits is concerned. To do this a multivariate analysis procedure, which indicates the

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*To test this assumption alternative models were considered. See discussion under "Indepth Treatment of Men's Centers", in Results section of this report.

**Change in coding structure in the JCIS and Screeners Handbook.

relationship between success as defined by the outcome scale and the individual characteristics, was used. Figures 3.1, 3.2, and 3.3 present the basic comparisons included in the investigation.

Factors such as age, race and size of home town, proved important. These factors considered often before in other contexts were examined here in light of cost benefits. From the cost benefit point of view the results are both interesting and informative. Strict analysis of these variables was combined with a second inquiry into the main program variables. The question was asked whether or not the results of the program comparisons would be different for different groups of corpsmembers. That is, "Do center types or centers prove more or less cost beneficial depending upon the type of corpsmember served, or, alternatively, will differential assignment of corpsmembers make the overall program more cost beneficial for all corpsmembers?". This latter question is only touched upon in this investigation, but proves to have great impact on program design and enrollee assignment procedures.

Finally, program effectiveness, exclusive of cost, was examined in those cases where cost benefit comparisons raised important issues. One case in point is corpsmember age. From the cost benefit point of view, young corpsmembers prove to be more cost beneficial. When one examines benefits alone, irrespective of cost, the conclusion is reversed. At issue here, is a philosophical point which is discussed further in the conclusions section: "Should program evaluation be center oriented or individually oriented?" This issue has important implications for the analysis of program results.

Information Sources:

The primary source of data used in this analysis was the Job Corps Information System (JCIS). This large system contains detailed information on corpsmembers including historical and demographic data, program accomplishments, event data (entry, termination, etc.), and placement information. Cost data as noted earlier was obtained from Job Corps finance records. In order to provided current results, records for corpsmembers who terminated prior to fiscal year 1968 were not included. Additionally, incomplete records, those which did not include the basic information needed for this analysis, were excluded. The procedure resulted in a final sample of approximately 40,000 individual records of enrollees terminating during this time period.

FIGURE 3.1

Matrix of Basic Comparisons Made for Conservation Centers in This Investigation

	Cost Benefits		Effectiveness		Special Studies
	Scale I	Scale II	Scale I	Scale II	
Centers					
Race	*	*	*	*	*
City Size	*	*	*	*	*
Race by City Size	*	*	*	*	*
Center Size					
Sponsor	*	*			
Placing Agent	*	*			
Center Type	*	*			
Age	*	*	*	*	*
Region	*	*			

The above figure illustrates the various analyses undertaken during this study. These analyses are summarized in the Results Section of this Volume. All comparision tables are included for examination in Volume II. Three additional scales were examined late in the investigation. They are not included in this report.

FIGURE 3.2

Matrix of Basic Comparisons Made for Womens Centers in This Investigation

	Cost Benefits		Effectiveness		Special Studies
	Scale I	Scale II	Scale I	Scale II	
Centers	*	*	*	*	*
Race	*	*	*	*	*
City Size	*	*	*	*	*
Race by City Size	*	*	*	*	*
Center Size	*	*			
Sponsor	*	*			
Placing Agent	*	*			
Center Type					
Age	*	*	*	*	*
Region	*	*			

The above figure illustrates the various analyses undertaken during this study. These analyses are summarized in the Results Section of this Volume. All comparision tables are included for examination in Volume II. Three additional scales were examined late in the investigation. They are not included in this report.

FIGURE 3.3

Matrix of Basic Comparisons Made for Mens Centers in This Investigation

	Cost Benefits		Effectiveness		Special Studies
	Scale I	Scale II	Scale I	Scale II	
Centers	•	•	•	•	•
Race	•	•	•	•	•
City Size	•	•	•	•	•
Race by City Size	•	•	•	•	•
Center Size	•	•			
Sponsor	•	•			
Placing Agent	•	•			
Center Type					
Age	•	•	•	•	•
Region	•	•			

The above figure illustrates the various analyses undertaken during this study. These analyses are summarized in the Results Section of this Volume. All comparision tables are included for examination in Volume II. Three additional scales were examined late in the investigation. They are not included in this report.

Section III

HIGHLIGHTS

1. Several previously established "betterness" conclusions were reversed when costs per program terminee were considered. Examining only absolute effectiveness, older corpsmen have traditionally proven to do better in Job Corps than younger enrollees (16 and 17 year olds). Similarly youth from large cities have as a group stayed longer in the program and had better placement records. Gary Job Corps Center has proven to be one of the more effective Men's Centers. These three results in particular have been reversed or at least questioned under scrutiny of cost per terminee.

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Each of the highlights treated above are examined in more detail in Section IV of this report.

Section IV

RESULTS

Since the results of this investigation are issue oriented, section one of this part of the report will focus in depth on one example situation. The nature of the scales used, the cost model, and cost effectiveness vs. strictly effectiveness analyses will be examined. Six men's urban centers have been selected for this examination since they provide the most stable data base due to their size. Further, definite positions as to their relative worth have evolved within Job Corps based upon patterns of success in training corpsmen as measured by existing objective and subjective evaluation procedures.

The six programs examined here are Atterbury, Breckinridge, Clearfield, Gary, Kilmer, and Parks. Each is a large men's center providing skill training to disadvantaged youth. Although each program differs in specific skill training offered, the population of youth each serves is effectively the same, and the overall program objectives have been considered by the Job Corps to be equivalent.

The data sources used in this investigation are the Job Corps Information System and official cost records. The population of terminees treated are those corpsmen who completed programs or otherwise left their centers during fiscal year 1968 and the first half of fiscal year 1969. A check of critical statistics, such as placement percentages, indicates that the data used for the study is valid; where deviations have occurred, the possible bias proved to have no effect on the overall results.

The discussion which follows immediately is the most important part of this document. It must be kept in mind when examining the more extensive presentation of data in Volume II. Interpretation of results is always difficult, but in this case is even more delicate since we are considering a new philosophy approach to program analysis.

For the main portion of this investigation two scales are used to compare program success. Each is constructed differently in order to provide as full a validation of the

results as possible. Scale I categorizes program terminees into eight groups (see Page 6). These categories are based upon reasons given for termination and the amount of time a corpsman stayed in the program. Scale II (see Page 7) is based upon job placement and designated programs success categories. The latter scale is intended to be largely time independent.

The costs used for computing cost benefits rankings are a product of costs per terminee, a function of operating costs per man-month and the man-months of training provided a corpsman.

An analysis of the six men's centers using the cost benefits model produces the ranking of the programs which is included in Table 4.1.

TABLE 4.1

Relative Cost Benefits Rankings for Men's Center Programs
Using Scale I. Standard Cost Model

Overall Rankings		Program by Program Comparison				
RANK	PROGRAM	KILMER	CLEARFIELD	ATTERBURY	GARY	PARKS
1	Breckinridge	3,II	2,IV	1,I	1,I	1,I
2	Kilmer		2,IV	1,I	1,I	1,I
3.	Clearfield			4,II	1,I	1,I
4	Atterbury				4,II	1,I
5	Gary					1,I
6	Parks					

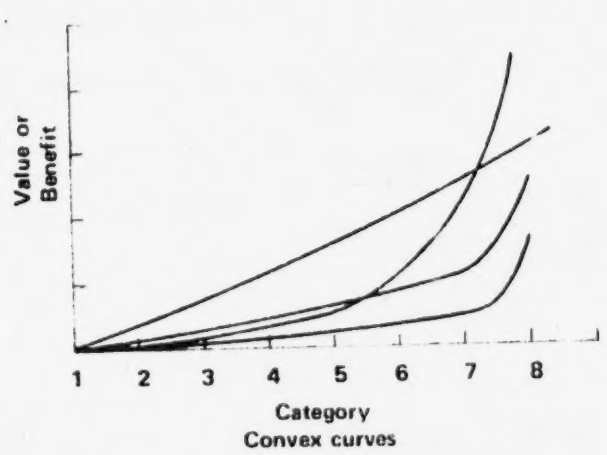
In the above table the arabic numbers represent levels of assumption under convex conditions. Roman numbers represent assumptions under concave conditions. The cell entry is the level at which the program in column one is determined to be more cost beneficial than the program heading the other columns.

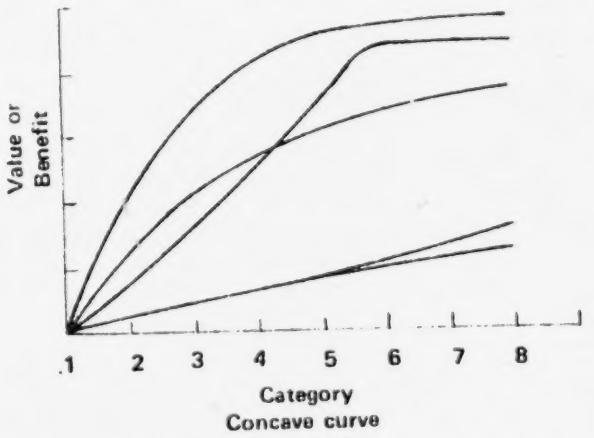
Column one in Table I represents the relative rank of the six programs. The numbers (arabic and roman) in the other columns of the table represent the level of assumption which must be made for any given center to outrank another. The arabic

number pertains to convex assumptions concerning the benefits curve. The roman number represents concave assumptions. A further explanation of these assumptions follows.

Exhibit 4.1

Examples of Convex and Concave Benefits Curves





An interpretation of the table shows Breckinridge to be the most cost beneficial men's center and Parks, the least cost beneficial. In between, the other centers rank as indicated on the left: Kilmer is second; Clearfield is third; and so on. This ranking is based on Scale I and the standard cost model.

Reading the rest of the table is a little more difficult due to the concepts involved. But it is the numbers which contain most of the important information concerning the rankings. The discussion of the model in Section II of this report gives considerable attention to the nature of the benefits curve. That is, if one were going to assign values to the outcome categories described by the scale, how should the values be assigned? The numbers in the table tell the reader how the values would have to be assigned if the cost benefit ranking is going to be accepted.

The meaning of the numbers, in light of the Table 4.1 discussion, is summarized below.

A. The number zero is the most powerful case. It is seldom seen, but if seen, it means that it is not possible to reach any other decision concerning the ranking, no matter what set of values are chosen for the categories. They can be scored best to worst; worst to best; high in the middle, low at either end- anything goes.

B. The number one, arabic or roman, in practical applications, is almost as powerful as zero. It requires only that the benefits curves, values assigned to the categories, are ordinal. That is, being a member of category eight is more valuable (beneficial) than being a member of category seven by some amount, small or large; and similarly, category seven has more value associated with it than category six; six beats five; and so on. (Note: it is all right for one or two groups to have the same value, so long as the values are not decreasing ones.)

C. The number two is slightly more restrictive than one. In the case of the number one, the shape of the benefits curve is completely irrelevant. The values simply increase from lowest to highest across categories. That the curve is convex (opening upward) or concave (opening downward) does not matter.

Specifically, level two assumptions require the user to determine whether most of the corpsmembers' benefits are greatest in the first few categories or in the upper categories. When are benefits gained from the program. For Scale I, which is heavily affected by length of stay, the question reduces to whether or not a corpsman benefits most from his early days in the program or from his later days in skill training.

D. Level three is only slightly more restrictive than level two. It simply says that the shape of the curve is important as in level two, but in addition there must be some perceptible gain for every category. Level two permits one or two categories to have the same value - an almost meaningless restriction in the case of a complex training program like Job Corps.

E. Level IV is the most restrictive case considered the model. To accept a cost benefits ranking at this level means that the der must assume that the benefits curve is linear (represented by a straight line which passes through the origin.) The latter simply means that the first outcome corresponds to a failure condition with no associated benefit. Such a set of values for 8 categories might be:

(0, 1, 2, 3, 4, 5, 6, 7)

or

(0, 10, 20, 30, 40, 50, 60, 70)

or

(0, 153, 306, 459, 612, 765, 918, 1071)

Returning to the results in Table 4.1:

TABLE 4.1

Relative Cost Benefits Rankings for Men's Center Programs
Using Scale I. -Standard Cost Model

Overall Rankings		Program by Program Comparison				
RANK	PROGRAM	KILMER	CLEARFIELD	ATTERBURY	GARY	PARKS
1	Breckinridge	3,II	2,IV	1,I	1,I	1,I
2	Kilmer		2,IV	1,I	1,I	1,I
3	Clearfield			4,II	1,I	1,I
4	Atterbury				4,II	1,I
5	Gary					1,I
6	Parks					

Column one represents the overall ranking of programs. The arabic and roman numbers represent the level of assumption necessary to accept a given comparison between programs. As the numbers increase, the power of the comparison decreases. It is not possible, however, for the rankings to be reversed. Rather, the user may choose not to accept the assumptions necessary and assume no relative program difference.

Consider:

Breckinridge is determined more cost beneficial than Atterbury, Gary and Parks at level one. This means that no matter what set of ordinal values the user chooses to assign to the outcome categories, Breckinridge remains the most cost beneficial. It does not matter whether one argues that most of the benefits are obtained early in the program or conversely, if one argues that the greatest value is attained late in the program. This is an exceptionally strong position.

Breckinridge is determined more cost beneficial than Kilmer at level three under convex assumptions and at level two under concave assumptions. The fact that the model requires this level of assumption indicates a greater degree of closeness than in the case of the above described three centers (Kilmer is also more cost beneficial than Atterbury, Gary, and Parks at level one.) Yet, Breckinridge remains significantly in position since the

model requires only that the values continue to increase if the convex case (greater worth later) is accepted, and that if the concave case is accepted, the increase to be regular and steady, with no two categories having the same value. Any of a very large set of benefits curves will satisfy these assumptions.

For example:

In the convex case, Breckinridge would beat Kilmer cost benefits wise if the values assigned to the eight categories were either:

(0, 1, 2, 3, 4, 5, 6, 7)

or

(0, 1, 4, 9, 16, 25, 36, 49)

or

(0, 2, 6, 12, 20, 30, 42, 56)

In the concave case, either of the following sets of values would satisfy the conditions:

(0, 10, 15, 15, 16, 17, 18, 19, 10)

or

(0, 1000, 1500, 2000, 2100, 2102, 2103, 2103)

In four cases a linear assumption is necessary for program by program comparisons to be made. It will be seen later (during discussion of cost models) that even this most restrictive case is a relatively strong position, and that comparisons which require level four may still be quite significant.

In summary, Table 4.1 indicates that Breckinridge is the most cost beneficial program of the six examined and further, that Breckinridge and Kilmer emphatically beat Atterbury, Gary, and Parks in the rankings. Further, as might be expected, it typically requires a higher level assumption for a program to be determined more cost beneficial than the next in line, than it does for those further down the rankings. Parks proves least beneficial and, significantly, is bested by all programs at level one on this scale.

Men's Centers, Scale II:

Scale I is heavily influenced by length of stay, and it might be argued that the strong correlation between length of stay and cost of training leads to spurious cost benefit rankings. In order to examine this situation, a second scale derived from a placement orientation (e.g. job placement is an extremely important criterion) has been devised. This six-category scale is a function of placement and program-based category of termination (see Page 7).

TABLE 4.2

Relative Cost Benefits Rankings for Men's Center Programs
Using Scale II.–Standard Cost Model

Overall Rankings		Program by Program Comparisons				
RANK	PROGRAM	KILMER	CLEARFIELD	ATTERBURY	GARY	PARKS
1	Breckinridge	3,II	1,I	1,I	3,II	0,0
2	Kilmer		2,IV	2,II	3,II	1,I
3	Clearfield			3,II	4,II	0,0
4	Atterbury				4,II	1,I
5	Gary					1,I
6	Parks					

In the table above, the arabic number indicates the level at which the center in the left hand column is more cost beneficial than the center heading the column under convex assumptions. The roman number refers to the concave case.

An examination of Table 4.2 indicates that the overall center rankings have not changed from Scale I to Scale II. Breckinridge continues to prove most cost beneficial while Parks makes another poor showing. Based upon this scale, Park's position is significantly weakened with two programs being identified as more beneficial at the seldom seen level zero. Gary, while remaining fifth in the overall rankings, forces, forces the assumptions to a higher level in all comparisons. An examination of the basic data indicates that this low ranking is due to Gray's very large percentage of Category I

corpsmen who are placed in jobs. (This group of corpsmen comprises category six on Scale II.) In spite of this large group and the fact that the decision level is forced upward in restrictions, Gary remains fifth in the rankings due to an excessively high unit cost per terminee.

In summary, the center rankings are unchanged from Scale I to Scale II although the assumptions required to accept the cost benefits decision increase. This is not particularly disconcerting since the following benefits assigned to the six categories would satisfy the Breckinridge-Gary comparison in the convex case:

(0, 2, 6, 12, 20, 30, 42)

or

(0, 10, 220, 630, 1240, 2050, 3060)

or in the concave case:

(0, 10, 15, 16, 17, 18)

or

(0, 1000, 1500, 2000, 2001, 2002)

The strength of the model and the confidence one can have in a decision made even at the higher levels of assumption can be seen when i ecting the variety of acceptable sets of benefits values.

If either of the scales, derived from usual criteria, have any validity, the results are startling. The rankings provided by the cost benefits model are different from what one might have expected. Gary has been singled out often as a low cost, high benefit program. In the discussion that follows, Gary will prove again to be a high benefit program. It incurs problems when low man year costs are converted into costs per terminee.

Men's Center Effectiveness:

The results just reported caused some initial concern. How is it possible that Gary ranks number five and Clearfield ranks number three on both scales? In order to validate

both the technique and the data base used in the study, costs per terminee are set as equal across all programs and benefits only are considered for both Scale I and Scale II.

The results of this analysis are presented in Table 4.3 which follows.

TABLE 4.3

Effectiveness Rankings for Men's Center Programs
on Both Scales I and II;
Costs Set Equal Compared With Previously Derived Ranking
Developed by Job Corps

RANK	Overall Ranking Scale I	Overall Ranking Scale II	Earlier Job Corps* Ranking
1	Breckinridge	Gary	Gary
2	Gary	Breckinridge	Breckinridge
3	Kilmer	Atterbury	Atterbury
4	Atterbury	Kilmer	Parks
5	Parks	Parks	Clearfield
6	Clearfield	Clearfield	Kilmer

*excluding the cost variable it is as developed 2/69 by J/P/P

The effectiveness rankings remain quite stable across Scales I and II, and except for the slip to position six on the earlier Job Corps ranking, remain quite stable across the three scales. The Kilmer slip is explained by the fact that the rankings in this investigation are based upon terminations in fiscal year 1968 and 1969 and the earlier ranking is based on fiscal year 1969 only, indicating a dramatic recent decrease in center performance. Further, the earlier ranking is a weighted sum of rankings* based on average length of stay, dropout rate, and placement percentage and educational gains; hence somewhat different. (In that ranking, educational gains were effectively constant across centers.)

More detailed examination of the data underlying the effectiveness rankings further confirmed the validity of the source data.

*This procedure tends to exaggerate small differences in absolute value on each scale.

A reexamination of Tables 4.1 and 4.2 in light of Table 4.3 shows the impact of this approach to program analysis. The success of a center like Gary becomes less inspiring when placed under the microscope of training costs per individual. Similarly, a center with a less exciting record like Clearfield looks significantly better when individual training costs are considered. Other programs such as Breckinridge stand up well under either type of examination.

The Cost Model:

It might be argued that the cost model used in this study is inappropriate. Since it is linear, it does not penalize sufficiently the center with a high turnover rate, which would reflect high setup costs, including testing, orientation, travel, screening, etc. It should be noted that it also fails to single out high cost training, travel, and allotments for terminees who remain in the program longer periods of time.

Granting the earlier arguments for the moment, let us consider several alternative models which emphasize front end loads (e.g., setup costs).

Table 4.4. compares three such models for criterion Scale I. They include the standard model (Table 4.1), a $300.00 setup cost per enrollee and a $1,000.00 setup cost. The stability of the results confirms the earlier findings.

TABLE 4.4

Relative Cost Benefits Comparisons for Men's Centers
on Scale I,
Examined Under Three Cost Models

RANK	Overall Ranking Standard Model	Overall Ranking $ 300 Setup Costs	Overall Ranking $ 1,000 Setup Costs
1	Breckinridge	Breckinridge	Breckinridge
2	Kilmer	Kilmer	Kilmer
3	Clearfield	Clearfield	Clearfield
4	Atterbury	Atterbury	Gary
5	Gary	Gary	Atterbury
6	Parks	Parks	Parks

With setup costs as high as $1,000 per enrollee, Gary moves up the scale only one level. All other programs hold the same relative positions attesting to the stability of the rankings. It might be worth a moment to note that even level four decisions cited in Table 4.1 remain unaffected with a $300 load factor. Identical results were achieved with Scale II.

Hence, neither the scale nor the cost model affects this particular ranking significantly and one can certainly state with confidence that Breckinridge is the most cost beneficial center and Parks is the least cost beneficial. The results of other comparisons will not be treated in the same detail in Volume I. All the necessary data to do so, however, is available in Volume II or in supporting documents submitted with this report.

An Interesting Sidelight:

Before proceeding with a discussion of the remainder of the findings it might be worth considering another side investigation related to men's centers in general and to Gary in particular. Gary has a very low man-year cost and a very high effectiveness ranking, yet it shows up poorly under cost benefit rankings. The most obvious reason is the long average length of stay and therefore high individual cost. Assuming that all other centers were held constant, what is the optimum length of stay for Gary (e.g. what average length of stay would move the program back to the top of the rankings on Scale II)?

An examination of this question indicates that Gary would have to have a 180 day average length of stay while not increasing operating costs and further maintaining its performance level to achieve first place on Scale II. This is a tall order calling for a change in operating philosophy.

Is it possible that the bases for evaluation represented by these scales are inappropriate. Is a Category I terminee or graduate as presently defined by Job Corps too ambiguous a term, thereby penalizing Gary? The question of criterion scales is raised again in Section VI of this volume.

Other Results:

The balance of the investigation will be treated in summary form in this section. The complete investigation includes the production of over 200 different comparisons.

All of these documents have been provided to Job Corps with this report. The majority of the data is also summarized in tabular form in Volume II. What follows is a narrative presentation of the findings presented, without further reference to concerns that might exist over choice of criterion scales.

The model and the data base have been adequately supported and should no longer remain at issue. The cost model has similarly withstood scrutiny.

Populations Considerations:

Several key population variables are examined in the course of this investigation in order to determine if differential effects do in fact exist. Is it possible that particular programs are more cost beneficial for one given subpopulation than for another? In addition, questions of strict effectiveness (without regard to cost) are treated for selected comparisons. A summary of these results follows. More detailed data is presented in Volume II.

Home Region:

The population of Job Corpsmen terminating in fiscal year 1968 and fiscal year 1969 is sub-divided by regions and is treated as separate program groups for the purpose of this analysis. Each of these regional subgroups is compared within center type on both Scale I and Scale II. Table 4.5 below summarizes the overall rankings for the regions for each of the six comparisons.

The relative success in training (cost benefits wise) of youth from a given regions remains fairly constant from Scale I to Scale II within center type indicating, as might be expected from the earlier discussion of Men's Center programs, that the cost benefits rankings remain stable. The differences across center type, however, prove very interesting.

Differences in regional rankings across center type are substantial. Is it possible that Men's Centers are most cost beneficial working with youth from region 6 while Women's Centers do very poorly with girls from the same region? Similar differences exist for the other regions considered. It is quite likely that these apparent regional differences are a function of the centers in the region in question since it is Job Corps' policy to place youth in centers near their home whenever possible.

TABLE 4.5

Cost Benefits Rankings for the Seven Job Corps Regions
Within Center Type for Both
Scale I and Scale II

RANK	MEN'S CENTERS		WOMEN'S CENTERS		CONSERVATION CENTERS	
	Scale I	Scale II	Scale I	Scale II	Scale I	Scale II
1	Region 6	Region 6	Region 1	Region 1	Region 7	Region 7
2	Region 2	Region 3	Region 3	Region 3	Region 4	Region 4
3	Region 3	Region 2	Region 7	Region 5	Region 6	Region 6
4	Region 7	Region 4	Region 5	Region 2	Region 5	Region 5
5	Region 4	Region 7	Region 2	Region 7	Region 2	Region 2
6	Region 1	Region 5	Region 4	Region 6	Region 3	Region 3
7	Region 5	Region 1	Region 6	Region 4	Region 1	Region 1

In summary, differential effects across center type are quite significant. These effects, however, might be the direct result of the performance of centers located in the regions in question.

Racial Effects:

A second population characteristic examined is the corpsmember's race. This particular factor has provided mixed results.

If one considers effectiveness only (costs held fixed), all centers are uniformly more successful in their efforts with Negro corpsmembers than with white youth. This is true for both Scale I and Scale II, and therefore supports earlier conclusions.

When effectiveness is examined in light of cost considerations, the results are less uniform. For each center type Men's, Women's, and Conservation it has been determined that the programs remain most cost beneficial for Negro youth as measured by Scale I. When Scale II is examined, the results are reversed. The extra costs incurred by a longer average length of stay are too great and overcome the increase in measured effectiveness. (Recall the Gary example where effectiveness rankings are similarly reversed by cost considerations.)

The scales apparently are measuring different things, sufficiently different to result in this interesting reversal. Apparently the significant success in holding Negro youth in programs (Scale I) is diminished when the problem of job placement is encountered after leaving the center (Scale II).

Size of Home Town:

In addition to race and region of the country from which a corpsman originates, size of home town has been examined. The results of this analysis are quite mixed both when effectiveness only (Table 4.6) and when cost effectiveness (Table 4.7) are considered. Preliminary interpretation indicates that size of home town might be a factor worth considering when making assignments to program. Further examination is, of course, required.

TABLE 4.6

Effectiveness Rankings for Size of Home Town by Center Type Costs Set Equal

	MEN'S CENTERS		WOMEN'S CENTERS		CONSERVATION CENTERS	
RANK	Scale I	Scale II	Scale I	Scale II	Scale I	Scale II
1	50,000-250,000	50,000-250,000	50,000-250,000	over 250,000	2,500-50,000	2,500-50,000
2	over 250,000	2,500-50,000	over 250,000	50,000-250,000	under 2,500	50,000-250,000
3	2,500-50,000	over 250,000	under 2,500	2,500-50,000	50,000-250,000	under 2,500
4	under 2,500	under 2,500	2,500-50,000	under 2,500	over 250,000	over 250,000

Inspection of the above table presents the reader with an interpretive dilemma. The effectiveness rankings for size of home town change both within and across center types. However, for both Men's Centers and Women's Centers there is a tendency to separate on a small vs. large continuum. Both these urbanized skill programs tend to do better with youth from large cities and more poorly with youth from rural areas. Conservation Centers on the other hand do well with rural youth on Scale I, reflecting

their holding power with rural youth. On Scale II, success with rural youth decreases significantly. This decrease reflects placement problems, due probably to a tendency for these corpsmen to return to low-employment rural areas. Significantly, the effectiveness of Conservation Centers is poorest for youth from metropolitan areas on both criterion scales. Hence, we see a correlation between the location of the center (rural urban) and the home town of the corpsman (rural-urban).

TABLE 4.7

Relative Cost Benefit Rankings
for Size of Home Town by Center Type
Standard Cost Model

	MEN'S CENTERS		WOMEN'S CENTERS		CONSERVATION CENTERS	
RANK	Scale I	Scale II	Scale I	Scale II	Scale I	Scale II
1	under 2,500	under 2,500	under 2,500	under 2,500	under 2,500	50,000-250,000
2	2,500-50,000	2,500-50,000	2,500-50,000	2,500-50,000	over 250,000	under 2,500
3	50,000-250,000	50,000-250,000	50,000-250,000	over 50,000	50,000-250,000	2,500-50,000
4	over 250,000	over 250,000	over 250,000	50,000-250,000	2,500-50,000	over 250,000

The above table shows strikingly similar results for Men's Centers and Women's Centers, indicating that the size of home town is important although it is not clear what the effect is specifically. The under 2,500 group, rural youth, prove most cost beneficial. These corpsmembers stay in the centers less time (Scale I effectiveness--Table 4.6) and hence have lower training costs. Even though Table 4.6 shows rural youth to be benefited least, the increase in benefits received by the other groups does not appear to justify the increased cost resulting from a longer time in program.

An earlier note should be re-emphasized here again. The comparisons made in this study are only as good as the criterion scales used. These criterion scales, while the best available, may be inappropriate measures of Job Corps objectives.

In general, it may be said in summary that while typical youth from large cities do better as a group than youth from rural areas, the increased benefits attained may not offset the increased cost resulting from long residency. The issue is one of diminishing returns and raises the question concerning the relative value (cost benefits wise) of two-year training programs. It seems that from an overall benefits point of view, a shorter period–say one year–might prove most economical and still achieve reasonable results. (The earlier case of Breckinridge might be worth closer examination in order to establish guidelines.)

Race and Size of Home Town:

The interaction of race and size of home town was thought to have possible consequences for program decisions. Like all interactions the results are very difficult to interpret, particularly when one factor is as complicated as size of home town has proved to be.

In the earlier discussion of racial comparisons, the programs prove most cost beneficial for Negro youth when Scale I is used as a criterion. For Scale II the programs prove most cost beneficial for white corpsmen. When size of home town is considered, the programs are generally most cost beneficial for rural youth.

The interaction of the two factors has provided some interesting results. For Conservation Centers the most cost beneficial groups are directly related to earlier findings. For Scale I, the programs prove most cost beneficial for rural Negroes. For Scale II, the program is most cost beneficial for white youth from middle sized cities. On Scale I the racial factor is clearly overpowering, with Negro youth sweeping the four top rankings for all four home town groupings. This is not true for Scale II where the results are mixed.

For Men's Centers the results are similarly predictable indicating that at least for this interaction of corpsman characteristics, the results are essentially additive with no surprises. For Women's Centers the results are less predictable but similarly not surprising.

Age Effects:

Job Corps has dealt extensively with the problem of young corpsmen. It has been demonstrated that the younger a corpsman the less successful Job Corps is. Sixteen and

seventeen year olds have proved particularly difficult in general since they are often unemployable because of age restrictions after having completed their programs.

Table 4.8 reexamines this issue and again confirms earlier findings. When effectiveness only, and not training costs, is considered, sixteen and seventeen year olds rank lowest.

TABLE 4.8

Effectiveness Rankings for Age Groupings Within Center Types
On Both Scale I and Scale II

	MEN'S CENTERS		WOMEN'S CENTERS		CONSERVATION CENTERS	
RANK	Scale I	Scale II	Scale I	Scale II	Scale I	Scale II
1	19	19	20	20	21	18
2	20	21	19	19	19	20
3	21	20	21	21	20	19
4	18	18	18	18	18	21
5	17	17	17	17	17	17
6	16	16	16	16	16	16

The plaguing question of diminishing returns reoccurs when the age question is examined from a cost benefits point of view. Table 4.9 presents the results of the cost benefit comparisons for age within center types.

TABLE 4.9

Relative Cost Benefit Rankings for Age Groupings Within Center Types
Standard Cost Model

	MEN'S CENTERS		WOMEN'S CENTERS		CONSERVATION CENTERS	
RANK	Scale I	Scale II	Scale I	Scale II	Scale I	Scale II
1	19	17	16	16	16	16
2	17	16	17	18	17	17
3	20	18	18	20	18	18
4	16	19	19	19	19	19
5	18	21	20	17	20	20
6	21	20	21	21	21	21

The table is by now self explanatory. The additional benefits gained by some age groups in comparison to 16 year olds (see Table 4.8) are not sufficient to overcome the additional training costs. This is particularly true in Women's Centers and in Conservation Centers where 16 year olds make a particularly strong showing. In the heavily skill training orien ed Men's Center, 16 and 17 year olds prove to be the most cost beneficial group. The longer length and therefore greater training cost is not paying off sufficiently for the other age groups.

Age–Another Scale:

The problem with the young corpsmen is the difficulty encountered in placing them in jobs. It has been determined that an additional criterion scale would be examined to see if it could reverse these disconcerting results. The new scale is simple and direct. It contains two categories for terminees; those placed and those not placed.

Based on this scale the results in Table 4.9 have been confirmed. In particular, it has been determined that 16 and 17 year olds have rank one and two respectively for all three center types.

Age–A Different Cost Model:

The issue of setup costs is examined again in this case. A setup cost of $400 per corpsman is added to each enrollee's cost of tr ing. Such a load tends to penalize low length of stay, high turnover groups. The resu e significant. On Scale I for Conservation Centers 16 and 17 year olds simply exchange position at the top of the ranking. For Men's Centers on Scale II, 16 and 17 year olds drop one place in the rankings. Again as in the opening example, neither the scale nor reasonable alternatives to the cost model seem to affect the rankings substantially.

Other Program Considerations:

As in the case of the population investigation above, these studies are most meaningful if the factor under consideration is examined within center type. Cost benefit rankings of center size and placing agent follow.

Center Size:

Center size is not examined for conservation centers since large and small centers have become indistinguishable. For Men's Centers, medium sized centers prove most cost beneficial on both scales. For Women's Centers, the larger centers are most beneficial under Scale I, and under Scale II medium centers are most cost beneficial. In the case of both Men's and Women's Centers, small centers are beaten at levels one and two indicating an overall poor performance by small centers.

Placing Agent:

The most cost beneficial placing agent is the corpsman himself. If one chooses to exclude this case, then either the local emplyment service or the center makes a strong showing in the case of Men's Centers. For Women's Centers, no clear pattern develops. In the case of Conservation Centers, the youth opportunity centers are second only to the corpsman himself. This particular comparison may be slightly spurious since appropriate cost data is not available and Scales I and II as designed are not particularly appropriate. Hence, these particular results should be considered as "indicators" only.

Women's Centers:

Center by center comparisons are made for Women's programs both from the view of effectiveness and cost benefit. The same type of analysis provided for men's centers is appropriate for women's centers. Since less information concerning previous rankings is available, the women's center results are provided here without extensive comment.

Table 4.10 summarizes the overall rankings for both studies, with and without cost considerations. Complete data including individual center comparisons and a third scale, placed-unplaced, are provided in Volume II.

Conservation Centers:

The present scales are not used to rank Conservation Centers. The difficulties are two fold. The small size of Conservation Centers makes it such that the data becomes insufficient for an eight point scale. That is, the number of terminees in each cell of the scale is so small that interpretation of the results would be dangerous. Further, the two

scales used do not give adequate treatment to program transfers. These transfers are a significant part of all terminees from conservation centers.

A new scale, especially appropriate for this case, has been prepared and analysis is proceeding while this report is being completed. The results of this investigation will be reported as an addendum to the study as soon as it is completed.

TABLE 4.10

Overall Effectiveness and Cost Benefit Rankings for Women's Centers
On Scale I and Scale II

RANK	COST BENEFITS		Effectiveness	
	Scale I	Scale II	Scale I	Scale II
1	NAT YWCA	NAT YWCA	NAT YWCA	NAT YWCA
2	TON POINT	TON POINT	EXCELAP	KEYSTONE
3	ALBUQUE	MCKINNEY	POLAND SP	EXCELAP
4	MCKINNEY	KEYSTONE	KEYSTONE	LOS ANG
5	HUNTTON	ALBUQUE	LOS ANG	CHARLESTN
6	POLAND SP	HUNTTON	CHARLESTN	MCKINNEY
7	MOSESLAKE	OMAHA	ALBUQUE	POLAND SP
8	OMAHA	JER CITY	ST LOUIS	ALBUQUE
9	KEYSTONE	MOSESLAKE	OMAHA	OMAHA
10	CLINTON	POLAND SP	GUTHRIE	ST LOUIS
11	JER CITY	EXCELAP	TON POINT	CLEVELAND
12	EXCELAP	CLINTON	MCKINNEY	TON POINT
13	MARQUETTE	CHARLESTN	CLINTON	GUTHRIE
14	CHARLESTN	ST LOUIS	CLEVELND	CLINTON
15	LOS ANG	LOS ANG	HUNTTON	HUNTTON
16	ST LOUIS	CLEVELAND	MARQUETTE	JER CITY
17	GUTHRIE	GUTHRIE	MOSESLAKE	MOSESLAKE
18	CLEVELND	MARQUETTE	JER CITY	MARQUETTE

Section V

SUMMARY AND CONCLUSIONS

The study just described represents the first application of a new procedure for making cost benefits comparisons. It is especially suited to education, training and social programs, where it is traditionally difficult to measure the true product of a program and therefore establish benefit or value for its participants. The difficulties associated with determining program benefit, along with arguments that cost is not a reasonable factor to be used in making program decisions, has led to a historical absence of cost benefit studies in this field.

The uniqueness of this investigation rests not only in its consideration of cost per terminee benefit but also in the procedure used to make program comparisons. The problem of assigning benefit weights is resolved. The procedure assumes, initially, no knowledge of the benefits and then passes through an iterative mathematical process. Increasing assumptions concerning the benefit weights are applied until a decision between two programs can be reached. The model and this procedure are discussed more completely in the Introduction to this volume and are treated mathematically in Section II of Volume II of this report.

Extensive examination of the model included empirical validation. During the process of this investigation it was determined that the procedure is sound and applicable to a situation in which manpower training programs are compared.

The application of the technique to Job Corps data files provided some initially startling results. In several instances, programs which historically had been considered, and demonstrated, exceptional were found to be less desirable in light of costs. Further, an examination of enrollee groups proved to be no less startling. It has been well documented in previous studies of Job Corps that Negro corpsmen have better performance records than whites: that younger corpsmen are more likely to do poorly in the

program, and that youth from rural areas will perform more poorly than urban and metropolitan youth. This investigation reversed the latter two "knowns". Additionally, earlier conclusions concerning racial groups were reversed when heavily oriented placement scales were used as criterion.

The primary issue was one of diminishing returns. Length of stay has been used as an indicator of program success. It was logically assumed that increased benefits would result from increased length of stay. Hence one of the primary measures of program success was length of stay. However, associated with increased length of stay is increased cost of training. This increased cost of training was not offset by relatively increasing benefits. The question of optimal length of stay naturally arises. Is it possible that there is a point in the average corpsman's tenure when maximum benefits per dollar invested have been obtained?

In analyzing this set of findings two methodological issues which might have produced spurious results were carefully examined.

Could it be that an inappropriate cost model had been selected? Or, was it possible that the criterion categories selected were inadequate? In particular, had inadequate treatment been given to fixed costs such as transportation and orientation? Exclusion of these costs might benefit centers with high turnover rates. Several alternative cost models which paid specific attention to these cost issues were examined. Only when unrealistically structured examples were considered was there any evidence of an affect on the rankings.

Several alternative criterion scales were also examined, each of the scales being based on a slightly different program philosophy. Only in selected instances did the criterion scales used prove important. One instance of this was the racial comparison where Negro youth proved to gain more benefit per dollar spent on a program based scale, and white youth gained more per dollar spent according to a placement based scale. Additional scales included a regionally adjusted wage scale. This scale also proved to have essentially similar results (see appendix).

With more refined measures: e.g., criterion scales, comes greater power. If one can determine the specific weights associated with each of the categories of this refined scale,

then the maximum power of the cost benefits technique is achieved. It is highly improbable that accurate weights can be determined; hence the usefulness of the technique described in this report is demonstrated. It is possible, though, to improve the definition of outcome categories by making them more appropriate to Job Corps objectives. It is this later effort in which enery should be expended.

What are the skills that we expect an individual to achieve in a manpower training program? Can we define levels of attainment? These refinements in defining criterion scales are important not only to cost benefits analyses, but to any analysis which compares programs or examines questions of relative program impact.

Appendix

VERIFICATION OF OUTCOME SCALES

In Addition to the two outcome scales analyzed in this report, three other Scales 3, 4, and 5 were developed and applied against the source data. The purpose in doing this was to verify the results of Scales 1 and 2.

Scale 3 was essentially a collapsing of Scale 2, into a category labeled "unplaced in a job" and another category labeled "placed in a job." "Placed" and "unplaced" have always been common measures of program success in Job Corps, so verification using this scale was felt to be essential.

Scale 4 was again similar to Scale 2, except that transfers were considered separately and placed in the highest category. This scale was only applicable to Conservation Centers and reflects the desirability of preparing Corpsmen in Conservations Centers for entrance into Men Centers.

Scale 5 was solely economic, based on attained starting wage after benefiting from Job Corps training. Category 1 membership included all unplaced corpsmembers and those placed at wages less than $1.00 per hour. Category 2 included those who were placed at a wage between $1.01 and $1.60 an hour. In Category 3 were those with hourly wages between $1.60 and $2.25. In Category 4 were those who started with more than $2.25 an hour. All wages were adjusted by economic factors to take into account wage differentials by state. That is, a laborer in New York State almost certainly will start at a high rate than his counterpart in Alabama, and this difference must be eliminated in order to enable comparisons to be made without bias.

Cost benefit rankings developed from these three scales and have been submitted to Job Corps. In general the rankings support the results presented within this report. None of these scales results in any reversals of previously mentioned results, which tends to validate the Scales 1 and 2. Nevertheless, the conscientious analyst must continually seek better measures of program objectives, particularly when the data base is nation-wide so that the details of individual program training are extremely difficult to represent with measurable outcomes.

A JOB CORPS STUDY OF RELATIVE COST BENEFITS

VOLUME II

RESULT HIGHLIGHTS

1. Several previously established "betterness" conclusions were reversed when costs per program terminee were considered. Examining only absolute effectiveness, older corpsmen have traditionally proven to do better in Job Corps than younger enrollees (16 and 17 year olds). Similarly youth from large cities have as a group stayed longer in the program and had better placement records. Gary Job Corps Center has proven to be one of the more effective Men's Centers. These three results in particular have been reversed or at least questioned under scrutiny of cost per terminee.

The question underlying all three of these reversals is the relative benefit of a long tenure in Job Corps. In each case, the reversal was a direct result of increased costs resulting from a long time spent in the program.

2. Examining the age phenomenon as a function of type of center indicates that Conservation Centers (small rural men's programs) prove to be more effective with young corpsmen than the larger urban Men's Center programs.

3. As might be expected, the large Men's Centers prove most effective with corpsmen from large cities and metropolitan areas. Similar results are achieved for Women's Centers (generally located in urban areas). Conservation Centers are most effective with rural youth. (All centers prove more cost effective with rural youth - a function of length of stay and diminishing benefit?).

4. Regional differences exist, but they appear to be a result of centers located in the region. Job Corps policy is to locate corpsmen in centers near home hence youth are typically enrolled in centers located within their home region.

5. Cost benefit rankings were suprisingly constant across criterion scales. Typically results achieved under the assumptions of one scale replicated when alternative scales were considered.

6. A linear cost model proved sufficient for the analysis. An examination of set up costs, including travel, proved incidental. The cost of transporting a corpsman to and from a center and orienting him/her is very small when compared to the average cost of training.

7. Interesting and confirming results were achieved when corpsmember race was considered. Negro corpsmembers generally performed better in terms of the effectiveness indicators considered. But, when cost effectiveness was examined, centers proved less cost beneficial with Negro youth, when a heavily placement oriented scale was considered, than with white youth. This indicates that even federal or regionally oriented programs have not solved the employment problem for Black terminees. This is confirmed when the results of the non-placement oriented scale are examined. This latter scale indicates that within the program the Negro corpsmembers prove to be a cost-beneficial group.

Each of the highlights treated above are examined in more detail in Section IV of this report.

Section I

INTRODUCTION

Volume II of this report contains a detailed presentation of the data which supports the results discussed in Volume I. The tables, contained in Section III, are presented essentially without comment except where it is necessary to clarify codes.

Each table in Section III examines all the individual comparisons which support a given ranking. For example, supporting the relative ranking of the six age groups are fifteen comparisons where the position of each group is considered relative to each of the others. Before 16 year olds can be established as having rank one, it must be compared not only to 17 year olds but also 18, 19, 20 and 21 year olds.

The purpose of this examination is to determine the level of assumption necessary before it is possible to accept the superiority of 16 year olds as far as cost benefit is concerned. For each comparison in the tables the arabic number represents the level of assumption necessary in the convex case, and the roman number identifies the conditions if the benefits curve is assumed concave. This notation is identical to that used in Volume I. It might be useful to review the detailed explanation of the levels of assumption and the interpretation rules outlined in the first part of Volume I, Section III, the results section.

For those mathematically inclined the mathematics underlying the procedure used in this investigation is presented in Section II. It should be noted that it is not easy reading but it is fully complete. The non-mathematical reader may prefer to review again the methodology portion of Section I (Introduction) and the first part of the results section in Volume I.

The mathematics has been taken with only minor modification from a paper (as yet unpublished) by B. Allen Benn and Gilmore S. Wheeler entitled "Relative Cost Benefit" in which the procedure was first developed.

The essence of the model is an iterative procedure in which one places greater and greater restrictions on the nature of the benefits curve until a cost benefits based decision among programs can be made. The initial assumptions place no requirements upon the values and benefits. It is assumed that there exists no knowledge nor even a philosophy which would give a clue to their nature. Failure to force a decision at a low level of assumption requires additional iteration until a decision is reached. The highest level is a linear assumption. A decision is always reached in this final case.

A review of the highlights of this study will help put the tables presented in Section II in some focus. The highlights preceed this Introduction.

Section II

THE MATHEMATICS OF THE MODEL

In many social/educational programs data bases are being maintained which contain biographical information on each individual (*e.g.*, age, months in school, broken home life?, home state, race, etc.). In addition to this information, performance data of some form are generally available (*e.g.*, test scores, ratings, final classification). After "benefiting" to some extent from the program, the condition of a participant's departure is recorded to complete his record. Usually more than one or two possible conditions of departure are recorded. For some programs, a great deal of intermediate results information is added to records as the program progresses.

For the moment, then, let us suppose there are exactly eight possible recorded outcomes which can be associated with any participant upon completing a program. An individual assigned to a particular program eventually will have exactly one recorded outcome, or result, $k=1, \ldots, 8$. At this point we would like to assume that in correspondence with each distinct recorded outcome k there is a non-negative benefit to society, b_k, which is independent of both the particular program in which the individual was enrolled and of particular characteristics of the individual. The achievement of the kth outcome is expected to depend on personal characteristics, but once there, the participants' associated benefit may no longer depend materially on his characteristics.

With our model in which each recorded outcome is associated with a benefit, we seek a means for comparing how well an individual might do in each program, taking into account varying costs of the program. If this problem can be solved, there exists a natural extension to target populations. This in turn leads to possible program or training center comparisons, and perhaps even to algorithms for purposes of optimal allocation of resources.

We still have to decide how to combine known costs and abstract benefits. Let B denote the associated benefit to be achieved by a new enrollee upon completion of his training. B is a random variable due to the lack of certainty concerning which outcome k will obtain. Since benefit is in fact an authentic social utility by assumption, it suffices to consider maximizing in some sense an expected benefit, E(B). The problem is that cost is also a random variable, depending perhaps on outcome k as well as the individual, and certainly on the program.

The power in whatever we will be able to assert about relative merits of programs with reference to a particular traget population will depend in effect on what can be asserted about the program impact on individuals. The functional form to apply at the individual level, therefore, must be in agreement with overall goals, the highest of which would be optimal allocation of scarce resources over all programs. It is natural for this reason to start with an abstract formulation for optimal allocation of resources, work down to the individual level, evaluate parameters and work back up to the appropriate level for decision-making. The ranking of programs or training centers is a good place to stop for most management purposes.

Before we continue much farther, some additional notation needs to be agreed upon and these and other basic assumptions and goals made explicit.

Throughout, upper case letters denote random variables and lower case either realization of random variables or variables known with certainty. (See the attached glossary for clarification of notation.)

Let $N_j\ (s_j/T_j)$ be a random variable denoting the number who can be trained through the jth program with funds s_j given a known population T_j from which enrollees are selected at random with replacements.[1] Total benefits B_j associated with N_j is a function of both N_j and T_j. By letting E denote the expectation operator, we can now state the allocation problem: Over the set of programs within the system, determine an optimal allocation by means of maximizing

$$\sum_j E\left\{B_j\left[(N_j(s_j/T_j)/T_j)\right]\right\} \qquad (1)$$

[1] That is, T is invariant from one selection to the next. Although this is essentially true in practice, this formulation is based solely on convenience.

Subject to $\sum s_j \leq s$ where s is the bound on dollar resource.

Fix s_j and T_j and consider the random variable N_j. With each individual l, $l=1, \ldots, N_j$, there is a benefit $B_j^{(l)}(1/T_j)$ which again is a random variable. Since each person is randomly picked from T_j, each $B_j^{(l)}(1/T_j)$ is indentically distributed, for $l=1, \ldots, N_j$, say as the random variable $B_j(1/T_j)$. Therefore, the total benefit for Program j is given by

$$B_j(N_j/T_j) = \sum_{l=1}^{N_j} B_j^{(l)}(1/T_j) \tag{2}$$

a compound random variable, which is known to have expected value given by

$$E\left\{B_j(N_j/T_j)\right\} = E\left\{B_j(1/T_j)\right\} E\left\{N_j\right\} \tag{3}$$

This means that the solution to (1) can be found by differentiating forms like (3) with respect to s_j and solving the following equation for each program:

$$E\left\{B_j(1/T_j)\right\} \frac{\partial E\left\{N_j(S_j/T_j)\right\}}{\partial s_j} = \lambda \tag{4}$$

Where λ is the Lagrange multiplier for temporarily relaxing the constraint $\sum s_j \leq s$. Each function $E\left\{N_j(s_j/T_j)\right\}$ will be differentiable in practice since a differentiable form will be chosen that fits historical data empitomizing results of allocating variable funds to existing programs.

It should be noted that with constant returns to scale, Equation (4) cannot be solved for s_j. In this case the optimal solution is to load all the s into the program with the highest $E\left\{B_j(N_j/T_j)\right\}$ given by (3). To the practitioner, however, such a solution (rather than the underlying assumption) is absurd so instead we recommend ranking the programs using Equation (3). Administrators are naturally concerned about programs with lowest rank. With constant returns to scale, $E\left\{N_j(s_j/T_j)\right\}$ takes the form $a_j(T_j)s_j + d_j$, so that $\frac{\partial E\left\{N_j(s_j)/T_j\right\}}{\partial s_j}$ becomes $a_j(T_j)$. It is interesting to observe

the meaning of $a_j(T_j)$; it is the inverse of the expected average participant cost with respect to the population T_j. This simple case therefore reduces the consideration of expected benefits in the form

$$E\left\{B_j(N_j/T_j)\right\} = \frac{E\left\{B_j(1/T_j)\right\}}{E\left\{(\text{cost/individual}/T_j)\right\}} = \frac{\text{average Program j benefit}}{\text{average Program j cost}}$$

Generally returns to scale are not constant but increasing. $E\left\{N_j(s_j/T_j)\right\}$ can be estimated from historical data, since expenditures are usually on an accrual basis with monthly financial reports, and the number and characteristics of individuals are known at any point in time. The point is there is nothing fundamentally difficult about this process, since it involves estimating a measurable quantity, number of people, on the basis of other equally measurable quantities such as level of spending. The factor $E\left\{B_j(1/T_j)\right\}$ is far more intangible because it involves benefits.

Observe that even in the most general case of Equation (4), the factor $\partial E\left\{N_j(s/T_j)\right\}/\partial s$ is a constant, β_j, for s_j and T_j fixed; and we are led to the need to develop ways to decide whether or not

$$\beta_j E\left\{B_j(1/T_j)\right\} = \lambda \tag{5}$$

If an allocation of funds exists such that $\sum s_j = s$ and, for all and j and k, $\beta_j E\left\{B_j(1/T_j)\right\} = \beta_k E\left\{B_k(1/T_k)\right\}$, then (5) is satisfied for each j and, as the constraint is also satisfied, the allocation is a solution to (1).

Unfortunately the statement "$\beta_j E\left\{B_j(1/T_j)\right\} = \beta_k E\left\{B_k(1/T_k)\right\}$" is extremely difficult to make with much assurance because its extreme sensitivity to error in the fact of the unknown nature of the benefits b_j, associated with each outcome category, i=1, . . . ,r. Whereas the statement "$\beta_j E\left\{B_j(1/T_j)\right\} \geqslant \beta_k E\left\{B_k(1/T_k)\right\}$" often times can be made with great assurance. When the latter occurs we say Program j has more, or at least as much, cost benefit than Program k, with respect to the target populations T_j and T_k, even though they generally are marginal benefits. With constant returns to scale, our nomenclature becomes exact.

With the above in mind, our approach (whether it is an allocation or ranking program to be solved) will be to compare two programs with the purpose of determining which has highest cost-benefit. If the determination results only from assumptions of non-negativity, then no limiting restrictions are placed on the b_i, and there can be little question concerning the result. Gradually more restrictions will be placed on the form of b_is until either one program is said to have higher cost-benefit than the other, or they appear equal. The increasing assumptions on the shape of the benefits curve serve, along with a certain computed coefficient of separation, to provide an intuitive feel for the relative closeness of ranked outcomes. Further, the probability of error can be computed and unacceptable error risks eliminated.

What we will do, then, is to develop equivalent (mathematically) definitions based upon relatively non-restrictive and intuitively obvious assumptions about the shape of the unknown benefits curve. These assumptions will always obviate the necessity of knowing the precise (absolute) value of membership in a given outcome state.

MATHEMATICS

The first part of this section deals with the algebra of comparing forms like $\beta E\left\{B(1/T)\right\}$, when β depends on the combination involving a program and allocated resources. A series of theorems and corresponding assumptions are presented as a foundation for discriminating between any two programs. The second part condenses the theory to a table of test conditions and an algorithm for use in practice.

A. General

Program A is said to be at least as cost-beneficial as Program B (denoted $A \succcurlyeq B$) for β_A and β_B given with reference to target population T_A and T_B, if

$$\beta_A E\left\{B_A(1/T_A)\right\} \geq \beta_B E\left\{B_B(1/T_B)\right\}$$

Let $P(k/A, T_A)$, k=1, . . ,r, denote the probability that outcome k occurs for a random selection from T_A under Program A, and similarly for Program B.

Theorem 1:

2. $A \succcurlyeq B$ if for each k=2, . . . , r

$\beta_A P(k/A, T_A) \geqslant \beta_B P(k/B, T_B)$

Proof: $\beta_A E\left\{B_A(1/T_A)\right\} \equiv \beta_A \sum_{k=1}^{r} b_k P(k/A, T_A) = \beta_A \sum_{k=2}^{r} b_k P(k/A, T_A)$ since $b_1 \equiv 0$

But for each k=2, . . . , r. $\beta_A P(k/A, T_A) \geqslant \beta_B P(k/B, T_B)$ implies

that $\beta_A b_k P(k/A, T_A) \geqslant \beta_B b_k P(k/B, T_B)$ so that

$$\beta_A E\left\{B_A(1/T_A)\right\} \geqslant \beta_B \sum_{k=2}^{L} b_k P(k/B, T_B) = \beta_B E\left\{B_B(1/T_B)\right\}$$

Assumption 1: The benefits are rank ordered so that $b_i \leqslant b_{i+1}$, i=1, . . . ,r-1.

The following are two theorems known for benefit only (ref. 5); that is, excluding the factors β_A and β_B. Although slight modification is all that is required for our purpose, the proof of Theorem 2 is presented for later use. Theorem 4 complements Theorem 3, and is proved using an approach which complements that for Theorem 3.

Lemma 1: (Abel's Summation Identity)

For two arbitrary sequences of numbers:

$$\left\{a_i\right\} \sum_{i=1}^{n} \quad \text{and} \quad \left\{b_i\right\} \sum_{i=1}^{n}$$

$$\sum_{i=1}^{n} a_i b_i = \sum_{i=1}^{n-1} \left[\left(\sum_{j=i=1}^{n} a_j\right) \left(b_{i+1} - b_i\right)\right] + \sum_{j=1}^{n} a_j b_1$$

Remarks:

That Abel's identity is obvious follows by analogy to the continuous case with a, and be functions, whose product is to be integrated, and the technique chosen

in integration by parts. The theory below therefore extends to continuous outcome scales as well, except that for nontrivial results concentration at zero is necessary.

Theorem 2:

With Assumptions 1, A $\succcurlyeq$ B if for each i=2, . . . , r the following occurs

$$\beta_A \sum_{k=1}^{r} P(j/A, T) > \beta \sum_{k=2}^{r} P(j/B, T)$$

Proof:

The theorem is true if $\beta_A \sum_{i=1}^{r} b_i P(i/A, T_A) \geq \beta_B \sum_{i=1}^{r} b_i P(i/B, T_B)$

$$\text{iff} \sum_{i=1}^{r} b_i \left[\beta_A P(i/A, T_A) - \beta_B P(i/B, T_B)\right] \geq o \tag{6}$$

(by Lemma 1)

$$\text{iff} \sum_{i=1}^{r-1} \left\{ \sum_{j=i+1} \left[\beta_A P(j/A, T_A) - \beta_B P(j/B, T_B)\right] \left[b_{i+1} - b_i\right] \right\} \tag{7}$$

$$+ \sum_{j=1}^{r} \left[\beta_A P(j/A, T_A) - \beta_B P(j/B, T_B)\right] b_1 \geq o$$

(by the zero point condition of the definiation of b_i)

$$\text{iff} \sum_{i=1}^{r-1} \sum_{j=1+1}^{r} \left[\beta_A P(j/A, T_A) - \beta_B P(j/B, T_B)\right] \left[b_{i+1} - b_i\right] \geq o \tag{8}$$

But by Assumption 1, $b_{i+1} - b \geq_i 0$ for each i=1, . . . , r-1, so that the last inequality holds if each multiplier is non-negative. That is, for i=2, . . , r

$$\sum_{j=i}^{r} \left[\beta_A P(j/A, T_A) - \beta_B P(j/B, T_B) \right] \geq o$$

which proves the theorem.

Assumption 2: The sequence of benefits $\{b_i\}$ is convex, *i.e.*, there is positive acceleration, $\Delta b_i \equiv b_{i+1} - b_i \geqslant b_i - b_{i-1}$ for i=2, - -, r-1. With this assumption Δb_i behaves as b_i in Assumption 1. This means in effect that Abel's identity can be reapplied, which leads to:

Theorem 3:

With Assumption 1 and 2, $A \gtrsim B$ if for each i=1, . . . ,r-1 for the following condition obtains

$$\beta_A \sum_{j=i}^{r-1} \sum_{k=j+1}^{r} P(k/A, T_A) \geqslant \beta_B \sum_{j=i}^{r-1} \sum_{k=j+1}^{r} P(k/B, T_B)$$

Assumption 3: The sequence of benefits $\{b_i\}$ is concave, *i.e.*, negatively accelerated

$\Delta b_i \leqslant \Delta b_{i-1}$ i=2, . . . , r-1.

Theorem 4:

With Assumptions 1 and 3, $A \gtrsim B$ if for each i=1, . . . , r-1 the following conditions obtains

$$\beta_A \sum_{j=1}^{i} \sum_{k=j+1}^{r} P(k/A, T_A) \geqslant \beta_B \sum_{j=1}^{i} \sum_{k=j+1}^{r} P(k/B, T_B)$$

Proof:

Recalling the proof of Theorem 2, the theorem is true with Assumption 1 if inequality 8 holds. Since an equivalent form of Abel's Identity is: for a_i, b_i arbitrary

$$\sum_{i=1}^{n} a_i b_i = \sum_{i=1}^{n-1} \left[\left(\sum_{j=1}^{i} a_j \right) (b_i - b_{i+1}) \right] + \sum_{j=1}^{n} a_j b_n \qquad (9)$$

inequality 8 can be rewritten as

$$\sum_{i=1}^{r-2} \left[\sum_{j=1}^{i} \sum_{k=j+1}^{r} \left[\beta_A P(k/A, T_A) - \beta_B P(k/B, T_B) \right] \right] (\Delta b_i - \Delta b_{i+1})$$

$$+ \sum_{j=1}^{r-1} \sum_{k=j+1}^{r} \left[\beta_A P(k/A, T_A) - \beta_B P(k/B, T_B) \, \Delta b_{r-1} \right] \geqslant 0 \qquad (10)$$

Now by Assumption 3 each factor $\Delta b_i - \Delta b_{i+1} \geq 0$ and, by Assumption 1, $\Delta b_{r-1} \geq 0$, so that it suffices for each coefficient to be non-negative. That is, for i=1, ... , r-1,

$$\sum_{j=1}^{i} \sum_{k=j+1}^{r} \left[\beta_A P(k/A, T_A) - \beta_B P(k/B, T_B) \right] \geq 0 \qquad (11)$$

The developments so far are not in themselves a complete theory. The reason is that in practice a small but significant number of cases none of the theorems can be invoked. That is to say, the conditions in the theorems are sufficient but not necessary.

When it occurs that none of the theorem applies, most administrators are willing to add even more restrictions in order to separate the programs in question, even at the risk of possible error.

A theory is needed that maintains the essence of Theorems 1 through 4, but which can be invoked with far fewer limitation. One answer which works nicely in practice is to further restrict the form of the b_is to a quadratic function in i, of the form

$$b_i = a(i-1) + b(i-1)^2$$

for i=1, . . . ,r. The coefficients a and b are arbitrary with the sole restriction that each $b > 0$. In addition, let us require the Assumption 1 be satisfied as well, so that the b_i are non-decreasing. Thus Theorems 1, 2 and 3 apply automatically if they can be invoked, as does the appropriate Theorem 4 or 5. But more specialized Theorems can be developed as well.

Definition 2:

The mean and variance of program outcomes with respect to a target population are defined as:

$$\mu_A = \sum_{i=1}^{r} (i-1) P(i/A, T_A)$$

$$\sigma_A^2 = \sum_{i=1}^{r} (i-\mu_A-1)^2 P(i/A, T_A)$$

Lemma 2:

If the b_i are quadratic in i, and with Assumption 1, $A \gg B$ iff

$$a\left[\beta_A(\sigma_A^2+\mu_A^2)-\beta_B(\sigma_B^2+\mu_B^2)\right]+b\left[\beta_A\mu_A-\beta_B\mu_B\right]\geq o \qquad (12)$$

Proof:

$$\text{The lemma is true iff } \beta_A\sum_{i=1}^{r} b_iP(i/A,T_A)\geq\beta_B\sum_{i=1}^{r} b_iP(i/B,T_B)$$

$$\text{iff } \beta_A\sum_{i=1}^{r}(i-1)^2P(i/A,T_A)+\beta_A b\sum_{i=1}^{r}(i-1)P(i/A,T_A)$$

$$\geq\beta_B a\sum_{i=1}^{r}(i-1)^2P(i/B,T_B)+\beta_B b\sum_{i=1}^{r}P(i/B,T_B)$$

$$\text{iff } a\left[\beta_A(\sigma_A^2+\mu_A^2)-\beta_B(\sigma_B^2+\mu_B^2)\right]+b\left[\beta_A\mu_A-\beta_B\mu_B\right]\geq o \qquad (13)$$

Theorem 5:

With the setting of Lemma 2, A ≽ B if either I, II, III or IV occur.

I. i) $a < o$

and ii) $\beta_A\mu_A\geq\beta_B\mu_B$

and iii) $\beta_A\left[(2r-3)\mu_A-(\sigma_A^2+\mu_A^2)\right]\geq\beta_B\left[(2r-3)\mu_B-(\sigma_B^2+\mu_B^2)\right]$ (14)

II. i) $b < o$

and ii) $\beta_A(\sigma_A^2+\mu_A^2)\geq\beta_B(\sigma_B^2+\mu_B^2)$

and iii) $\beta_A\left[\sigma_A^2+\mu_A^2-\mu_A\right]\geq\beta_B^2\left[\sigma_B^2+\mu_B^2-\mu_B\right]$ (15)

III. i) $a > o,\ b\geq o$

and ii) $\beta_A\mu_A\geq\beta_B\mu_B$

and iii) $\beta_A(\sigma_A^2+\mu_A^2)\geq\beta_B(\sigma_B^2+\mu_B^2)$

IV. i) $a=o$

and ii) $\beta_A\mu_A\geq\beta_B\mu_B$

Proof:

I. Assume $a < o$; that is, the benefit function is concave. In order that benefits remain non-decreasing throughout the range of outcomes,

$$a(r-1)^2 + b(r-1) \geq a(r-2)^2 + b(r-2) \tag{16}$$

since the effect of a negative second order term is extreme at the highest outcome. This means that

$$\begin{aligned} &a(2r-3) + b \geq o \\ \text{or} \quad &b \geq -a(2r-3) \end{aligned} \tag{17}$$

From inequality (13), we know the theorem holds iff

$$a\left[\beta_A (\sigma_A^2 + \mu_A^2) - \beta_B (\sigma_B^2 + \mu_B^2)\right] + b\left[\beta_A\mu_A - \beta_B\mu_B\right] \geq o \tag{18}$$

By (I,ii) the factor multiplying b is non-negative so that the left hand side of (18) is

$$\begin{aligned} &\geq a\left[\beta_A (\sigma_A^2 + \mu_A^2) - \beta_B (\sigma_B^2 + \mu_B^2)\right] - a(2r-3)\left[\beta_A\mu_A - \beta_B\mu_B\right] \\ &= -a\left\{(2r-3)\left[\beta_A\mu_A - \beta_B\mu_B\right] - \beta_A (\sigma_A^2 + \mu_A^2) + \beta_B (\sigma_B^2 + \mu_B^2)\right\} \end{aligned} \tag{19}$$

Expression (19) is non-negative, since $-a > o$, if the expression within the braces exceeds zero, which establishes the meaningfulness of (I.iii).

II. Assume $b < o$; hence, for $b_i \geq o$, $a > o$, so that the benefit function is a special case of convex parabola. In addition, to prevent $b_i < o$, it is clear that

$$\begin{aligned} &b_2 = a+b \geq o \\ \text{or} \quad &a \geq -b \end{aligned} \tag{20}$$

With (I,ii), therefore, the left hand side of (18) is

$$\begin{aligned} &\geq -t\left[\beta_A (\sigma_A^2 + \mu_A^2) - \beta_B (\sigma_B^2 + \mu_B^2)\right] + b_2\left[\beta_A\mu_A - \beta_B\mu_B\right] \\ &= -b\left\{\beta_A\left[\sigma_A^2 + \mu_A^2 - \mu_A\right] - \beta_B\left[\sigma_B^2 + \mu_B^2 - \mu_B\right]\right\} \\ &\geq o \end{aligned}$$

since $-b > o$ and (II,iii), establishing (II,iii).

III. & IV. Assume $a > o$ and $b \geq o$, so from inequality 18 conditions (III,ii) and (III,iii) obviously obtain. If $a=o$ then $b \geq o$, and, again by inequality 18, (IV,ii) follows, completing the proof.

B. Summary

Application of the theory just developed depends as much on objectives of any analysis as on the form of the data base. Oftentimes, it is appropriate to make the simplifying assumptions that input populations are homogeneous for all programs within a stratum under consideration[1] and that program costs vary linearly with the number of participants in the program. As we saw before, the latter leads to the study of average benefits to average costs. With this setting it is convenient to illustrate the condition in a compact form for testing the relative cost-benefit of one program to another. Table 1, contains all levels of restrictions placed on the benefits with corresponding test conditions for sufficiency conditions guaranteeing that $A \gg B$. All parameters in the table have been previously defined except C_A and C_B which represent unit costs of Programs A and B, respectively (the inverses of β_A and β_B). The convex strictly parabolic test conditions are for both $b > o$ and $b < o$ simultaneously, and follow easily by combining parts II and III of Theorem 5.

The ranking algorythm above has been programmed in FORTRAN on an IBM 1130 with 8K core storage and a disk and can handle up to 110 programs at one time. An added feature of the program is an option to treat outcome history as a sample of some statistical population, rather than as fact. With the option, statistical tests appropriate to each level of test condition are invoked. For example, for levels 0, 1, and 2, $A \gg B$ is considered statistically valid if for each category comparison the null hypothesis of "equally" is rejected in favor of "inequality." Since this requires consideration of a single category at a time, the appropriate statistical test becomes similar to a simple one-way contingency table, complicated only by the necessity for including costs.

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[1] Or that input populations are heterogeneous, but they are assumed to remain that way, and the manager may want to compare programs on the basis of accomplishment without reflecting target population differences.

TABLE 1

Restrictions and Test Conditions

LEVEL	RESTRICTIONS	TEST CONDITIONS
0	$b_i \geq o$, i=2, . . . , r	$P(i/A)/C_A \geq P(i/B)/C_B$, i=2, . . . , r
1	$b_i > b_{i-1} \geq o$, i=2, . . . , r	$\frac{1}{C_A} \sum_{j=i}^{r} P(j/A) \geq \frac{1}{C_B} \sum_{j=i}^{r} P(j/B)$, i=2, . . . , r
2a (convex)	$b_i > b_{i-1} \geq o$, i=2, . . . , r and $\Delta b_i \equiv b_{i+1} - b_i \geq b_i - b_{i-1}$, i=2, . . . , r-1	$\frac{1}{C_A} \sum_{j=i}^{r-1} \sum_{k=j+1}^{r} P(k/A) \geq \frac{1}{C_B} \sum_{j=i}^{r-1} \sum_{k=j+1}^{r} P(k/B)$
2b (concave)	$b_i > b_{i-1} \geq o$, i=2, . . . , r and $\Delta b_i \leq \Delta b_{i-1}$ i=2, . . . , r-1	$\frac{1}{C_A} \sum_{j=1}^{i} \sum_{k=j+1}^{r} P(k/A) \geq \frac{1}{C_B} \sum_{j=1}^{i} \sum_{k=j+1}^{r} P(k/B)$
3a (convex strictly parabolic)	$b_i = a(i-1)^2 + b(i-1)$ with $a > o$	i) $\frac{1}{C_A} \mu_A \geq \frac{1}{C_B} \mu_B$ ii) $\frac{1}{C_A} \left[\sigma_A^2 + \mu_A^2 - \mu_A\right] \geq \frac{1}{C_B} \left[\sigma_B^2 + \mu_B^2 - \mu_B\right]$
3b (concave strictly parabolic)	$b_i = a(i-1)^2 + b(i-1)$ with $a > o$	i) $\frac{1}{C_A} \mu_A \geq \frac{1}{C_B} \mu_B$ ii) $\frac{1}{C_A} \left[(2r-3)\mu_A - (\sigma_A^2 + \mu_A^2)\right]$ $\geq \frac{1}{C_B} \left[(2r-3)\mu_B - (\sigma_B^2 + \mu_B^2)\right]$
4 (linear)	$b_i = b(i-1)$	$\frac{1}{C_A} \mu_A \geq \frac{1}{C_B} \mu_B$

GLOSSARY

b_i is defined as the benefit associated with any obtained category i=1, . . . ,r. b_i has a zero point, corresponding to an category 1, indicating no improvement. b_i is non-negative, i.e., benefits are never negative in value. Although it could be argued that an individual might use learning in anti-social ways, and thus give b_i a negative value, for purposes of this model, learning is considered positive.

B_i is defined as the benefit associated with training an individual, with the specific outcome to be determined upon completion of training. B is a random variable, because it is uncertain which outcome the individual will achieve.

s_j is defined as the amount of dollar resources to be allocated to the jth program. S_j is a random variable because it is a function of the characteristics of participant individuals, of the specific program, and of the r's achieved.

T_j is defined as the population characteristics of the participants to be trained with program j.

N_j the number of participants to be trained with program j.

$P[\cdot]$ denotes the probability of the event specified in the brackets.

$E[\cdot]$ denotes the expectation of the random variable specified in the brackets.

Section III

COMPLETE RESULTS TABLES

The tables which follow have been grouped by concept category. That is, all tables which deal with age are presented together, all tables which deal with city size are presented together and so on.

Each Section is preceded by a brief explanation of the coding system used in the tables contained in that group. For a detailed discussion of how to read these tables see the discussion of Men's Centers which leads the results section in Volume I. (A portion of this discussion is reproduced as an appendix to this volume.)

A complete listing of all tables follows:

TABLE NUMBER	TITLE
3.1	Relative Cost Benefits Rankings for Age Comparisons Within Men's Centers on Scale I-Standard– Cost Model
3.2	Relative Cost Benefits Rankings for Age Comparisons Within Men's Centers on Scale II Standard Cost Model
3.3	Relative Cost Benefits Rankings for Age Comparisons Within Men's Centers on Scale III–Standard Cost Model
3.4	Relative Effectiveness Rankings for Age Comparisons Within Men's Centers on Scale I Standard Cost Model
3.5	Relative Effectiveness Rankings for Age Comparisons Within Men's Centers on Scale II Standard Cost Model
3.6	Relative Cost Benefits Rankings for Age Comparisons Within Women's Centers on Scale I Standard Cost Model
3.7	Relative Cost Benefits Rankings for Age Comparisons Within Women's Centers on Scale II Standard Cost Model
3.8	Relative Cost Benefits Rankings for Age Comparisons Within Women's Centers on Scale III Standard Cost Model
3.9	Relative Effectiveness Rankings for Age Comparisons Within Women's Centers on Scale I Standard Cost Model

TABLE NUMBER	TITLE
3.10	Relative Effectiveness Rankings for Age Comparisons Within Women's Centers on Scale II Standard Cost Model
3.11	Relative Effectiveness Rankings for Age Comparisons Within Women's Centers on Scale III Standard Cost Model
3.12	Relative Cost Benefits Rankings for Age Comparisons Within Conservation Centers on Scale Standard Cost Model
3.13	Relative Cost Benefits Rankings for Age Comparisons Within Conservation Centers on Scale I Standard Cost Model
3.14	Relative Cost Benefits Rankings for Age Comparisons Within Conservation Centers on Scale III Standard Cost Model
3.15	Relative Effectiveness Rankings for Age Comparisons Within Conservation Centers on Scale I Standard Cost Model
3.16	Relative Effectiveness Rankings for Age Comparisons Within Conservation Centers on Scale II Standard Cost Model
3.17	Relative Cost Benefits Rankings for Age Comparisons Within All Centers on Scale I Standard Cost Model
3.18	Relative Cost Benefits Rankings for Age Comparisons Within All Centers on Scale II Standard Cost Model
3.19	Relative Cost Benefits Rankings for Age Comparisons Within Conservation Centers on Scale III Standard Cost Model
3.20	Relative Cost Benefits Rankings for City Size Comparisons Within Men's Centers on Scale I Standard Cost Model
3.21	Relative Cost Benefits Rankings for City Size Comparisons Within Men's Centers on Scale II Standard Cost Model
3.22	Relative Cost Benefits Rankings for City Size Comparisons Within Men's Centers on Scale III Standard Cost Model
3.23	Relative Effectiveness Rankings for City Size Comparisons Within Men's Centers on Scale I Standard Cost Model
3.24	Relative Effectiveness Rankings for City Size Comparisons Within Men's Centers on Scale II Standard Cost Model
3.25	Relative Cost Benefits Rankings for City Size Comparisons Within Women's Centers on Scale I Standard Cost Model
3.26	Relative Cost Benefits Rankings for City Size Comparisons Within Women's Centers on Scale II Standard Cost Model
3.27	Relative Cost Benefits Rankings for City Size Comparisons Within Women's Centers on Scale III Standard Cost Model
3.28	Relative Effectiveness Rankings for City Size Comparisons Within Women's Centers on Scale I Standard Cost Model

TABLE NUMBER	TITLE
3.29	Relative Effectiveness Rankings for City Size Comparisons Within Women's Centers on Scale II Standard Cost Model
3.30	Relative Cost Benefits Rankings for City Size Comparisons Within Conservation Centers on Scale I Standard Cost Model
3.31	Relative Cost Benefits Rankings for City Size Comparisons Within Conservation Centers on Scale II Standard Cost Model
3.32	Relative Cost Benefits Rankings for City Size Comparisons Within Conservation Centers on Scale III Standard Cost Model
3.33	Relative Effectiveness Rankings for City Size Comparisons Within Conservation Centers on Scale I Standard Cost Model
3.34	Relative Effectiveness Rankings for City Size Comparisons Within Conservation Centers on Scale II Standard Cost Model
3.35	Relative Effectiveness Rankings for City Size Comparisons Within Conservation Centers on Scale III Standard Cost Model
3.36	Relative Cost Benefits Comparisons for Racial Groups Standard Cost Model
3.37	Relative Cost Benefits Rankings for Race by City Size Comparisons Within Men's Centers on Scale I Standard Cost Model
3.38	Relative Cost Benefits Rankings for Race by City Size Comparisons Within Men's Centers on Scale II Standard Cost Model
3.39	Relative Cost Benefits Rankings for Race by City Size Comparisons Within Women's Centers on Scale I Standard Cost Model
3.40	Relative Cost Benefits Rankings for Race by City Size Comparisons Within Women's Centers on Scale II Standard Cost Model
3.41	Relative Cost Benefits Rankings for Race by City Size Comparisons Within Conservation Centers on Scale I Standard Cost Model
3.42	Relative Cost Benefits Rankings for Race by City Size Comparisons Within Conservation Centers on Scale II Standard Cost Model
3.43	Relative Cost Benefits Rankings for Race by City Size Comparisons Within All Centers on Scale I Standard Cost Model
3.44	Relative Cost Benefits Rankings for Race by City Size Comparisons Within All Centers on Scale II Standard Cost Model
3.45	Relative Cost Benefits Rankings for Region Comparisons Within Men's Center on Scale I Standard Cost Model
3.46	Relative Cost Benefits Rankings for Region Comparisons Within Men's Center on Scale II Standard Cost Model
3.47	Relative Cost Benefits Rankings for Region Comparisons Within Women's Centers on Scale I Standard Cost Model

TABLE NUMBER	TITLE
3.48	Relative Cost Benefits Rankings for Region Comparisons Within Women's Centers on Scale II Standard Cost Model
3.49	Relative Cost Benefits Rankings for Region Comparisons Within Conservation Centers on Scale I Standard Cost Model
3.50	Relative Cost Benefits Rankings for Region Comparisons Within Conservation Centers on Scale II Standard Cost Model
3.51	Relative Cost Benefits Rankings for Reg on Comparisons Within All Centers on Scale II Standard Cost Model
3.52	Relative Cost Benefits Rankings for Placing Agent Comparisons Within Men's Centers on Scale I Standard Cost Model
3.53	Relative Cost Benefits Rankings for Placing Agent Comparisons Within Men's Centers on Scale II Standard Cost Model
3.54	Relative Cost Benefits Rankings for Placing Agent Comparisons Within Women's Centers on Scale I Standard Cost Model
3.55	Relative Cost Benefits Rankings for Placing Agent Comparisons Within Women's Centers on Scale II Standard Cost Model
3.56	Relative Cost Benefits Rankings for Placing Agent Comparisons Within Conservation Centers on Scale I Standard Cost Model
3.57	Relative Cost Benefits Rankings for Placing Agent Comparisons Within Conservation Centers on Scale II Standard Cost Model
3.58	Relative Cost Benefits Rankings for Center Size Comparisons Within Men's Centers on Scale I Standard Cost Model
3.59	Relative Cost Benefits Rankings for Center Size Comparisons Within Men's Centers on Scale II Standard Cost Model
3.60	Relative Cost Benefits Rankings for Center Size Comparisons Within Women's Centers on Scale I Standard Cost Model
3.61	Relative Cost Benefits Rankings for Center Size Comparisons Within Women's Centers on Scale II Standard Cost Model
3.62	Relative Effectiveness Rankings for Comparisons Within Conservation Centers Types on Scale I Standard Cost Model
3.63	Relative Cost Benefits Rankings for Sponsor Comparisons Within Conservation Centers on Scale II Standard Cost Model
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3.65	Relative Cost Benefits Rankings for Sponsor Comparisons Within Men's Centers on Scale II Standard Cost Model
3.66	Relative Cost Benefits Rankings for Sponsor Comparisons Within Conservation Centers on Scale I Standard Cost Model

TABLE NUMBER	TITLE
3.67	Relative Cost Benefits Rankings for Sponsor Comparisons Within Conservation Centers on Scale II -Standard Cost Model
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3.70	Relative Cost Benefits Rankings for All Men's Centers on Scale I Standard Cost Model
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3.77	Relative Cost Benefits Rankings Within All Men's Centers on Scale II Standard Cost Model, Gary L.O.S. Set to 225 Days
3.78	Relative Cost Benefits Rankings for All Men's Centers on Scale II Standard Cost Model, Gary L.O.S. Set to 210 Days
3.79	Relative Cost Benefits Rankings for All Men's Centers on Scale II Standard Cost Model, Gary L.O.S. Set to 195 Days
3.80	Relative Cost Benefits Rankings for All Men's Centers on Scale II Standard Cost Model, Gary L.O.S. Set to 180 Days
3.81	Relative Cost Benefits Rankings for Women's Centers on Scale I Standard Cost Model
3.82	Relative Cost Benefits Rankings for Women's Centers on Scale II Standard Cost Model
3.83	Relative Effectiveness Rankings for Women's Centers on Scale I Standard Cost Model
3.84	Relative Effectiveness Rankings for Women's Centers on Scale II Standard Cost Model

AGE COMPARISONS

Tables 3.1 through 3.19

TABLE 3.1

Relative Cost Benefits Rankings for Age Comparisons Within Men's Centers on Scale I Standard Cost Model

Overall Rankings	Program by Program Comparisons				
	17 Years	20 Years	16 Years	18 Years	21 Years
19 Years	2,IV	1,I	2,IV	2,IV	1,I
17 Years		4,II	2,IV	4,II	4,II
20 Years			2,IV	3,IV	3,II
16 Years				4,II	4,II
18 Years					3,II
21 Years					

TABLE 3.2

Relative Cost Benefits Rankings for Age Comparisons Within Men's Centers on Scale II Standard Cost Model

Overall Rankings	Program by Program Comparisons				
	16 Years	18 Years	19 Years	21 Years	20 Years
17 Years	2,IV	4,II	4,II	3,II	3,II
16 Years		4,II	4,II	4,II	4,II
18 Years			3,II	1,I	1,I
19 Years				1,I	2,IV
21 Years					2,IV
20 Years					

TABLE 3.3

Relative Cost Benefits Rankings for Age Comparisons Within Men's Centers on Scale III Standard Cost Model

Overall Rankings	Program by Program Comparisons				
	17 Years	18 Years	19 Years	21 Years	20 Years
16 Years	0,0	0,0	0,0	0,0	0,0
17 Years		0,0	0,0	0,0	0,0
18 Years			0,0	0,0	0,0
19 Years				0,0	0,0
21 Years					0,0
20 Years					

TABLE 3.4

Relative Effectiveness Rankings for Age Comparisons Within Men's Centers on Scale I Standard Cost Model

Overall Rankings	Program by Program Comparisons				
	20 Years	17 Years	18 Years	16 Years	21 Years
19 Years	1,I	2,IV	2,IV	2,IV	1,I
20 Years		2,IV	3,IV	2,IV	3,II
17 Years			4,II	2,IV	4,II
18 Years				2,IV	3,II
16 Years					4,II
21 Years					

TABLE 3.5

Relative Effectiveness Rankings for Age Comparisons Within Men's Centers on Scale I Standard Cost Model

Overall Rankings	Program by Program Comparisons				
	21 Years	20 Years	18 Years	17 Years	16 Years
19 Years	1,I	1,I	1,I	1,I	1,I
21 Years		2,IV	2,II	1,I	1,I
20 Years			3,IV	1,I	1,I
18 Years				1,I	1,I
17 Years					1,I
16 Years					

TABLE 3.6

Relative Cost Benefits Rankings for Age Comparisons Within Women's Centers on Scale I Standard Cost Model

Overall Rankings	Program by Program Comparisons				
	17 Years	18 Years	19 Years	20 Years	21 Years
16 Years	4,II	4,II	4,II	4,II	4,II
17 Years		4,II	4,II	4,II	4,II
18 Years			3,II	3,II	1,I
19 Years				4,II	1,I
20 Years					2,IV
21 Years					

TABLE 3.7

Relative Cost Benefits Rankings for Age Comparisons Within Women's Centers on Scale II -Standard Cost Model

Overall Rankings	Program by Program Comparisons				
	18 Years	20 Years	19 Years	17 Years	21 Years
16 Years	4,II	4,II	4,II	4,II	4,II
18 Years		4,II	2,II	2,IV	1,I
20 Years			2,IV	2,IV	2,IV
19 Years				2,IV	1,I
17 Years					4,II
21 Years					

TABLE 3.8

Relative Cost Benefits Rankings for Age Comparisons Within Women's Centers on Scale III Standard Cost Model

Overall Rankings	Program by Program Comparisons				
	17 Years	18 Years	19 Years	21 Years	20 Years
16 Years	0,0	0,0	0,0	0,0	0,0
17 Years		0,0	0,0	0,0	0,0
18 Years			0,0	0,0	0,0
19 Years				0,0	0,0
21 Years					0,0
20 Years					

TABLE 3.9

Relative Effectiveness Rankings for Age Comparisons
Within Women's Centers on Scale I--Standard Cost Model

Overall Rankings	Program by Program Comparisons				
	19 years	21 Years	18 Years	17 years	16 years
20 years	1,I	1,I	1,I	1,I	1,I
19 years		2,IV	1,I	1,I	1,I
21 years			3,II	1,I	1,I
18 years				1,I	1,I
17 years					1,I
16 years					

TABLE 3.10

Relative Effectiveness Rankings for Age Comparisons
Within Women's Centers on Scale II- Standard Cost Model

Overall Rankings	Program by Program Comparisons				
	19 years	21 Years	18 years	17 years	16 years
20 years	1,I	1,I	1,I	1,I	1,I
19 years		2,IV	1,I	1,I	1,I
21 years			2,II	1,I	1,I
18 years				1,I	1,I
17 years					1,I
16 years					

TABLE 3.11

Relative Effectiveness Rankings for Age Comparisons Within Women's Centers on Scale III- Standard Cost Model

Overall Rankings	Program by Program Comparisons				
	17 Years	18 Years	20 Years	19 Years	21 Years
16 Years	0,0	0,0	0,0	0,0	0,0
17 Years		0,0	0,0	0,0	0,0
18 Years			0,0	0,0	0,0
20 Years				0,0	0,0
19 Years					0,0
21 Years					

TABLE 3.12

Relative Cost Benefits Rankings for Age Comparisons Within Conservation Centers on Scale I–Standard Cost Model

Overall Rankings	Program by Program Comparisons				
	17 Years	18 Years	19 Years	20 Years	21 Years
16 Years	4,II	4,II	4,II	4,II	4,II
17 Years		4,II	4,II	3,II	3,II
18 Years			3,II	2,II	1,I
19 Years				2,II	2,II
20 Years					3,IV
21 Years					

TABLE 3.13

Relative Cost Benefits Rankings for Age Comparisons Within Conservation Centers on Scale II Standard Cost Model

Overall Rankings	Program by Program Comparisons				
	17 Years	18 Years	19 Years	20 Years	21 Years
16 Years	3,II	3,II	3,I	3,II	3,II
17 Years		3,II	3,II	3,II	3,II
18 Years			3,II	3,II	1,I
19 Years				2,IV	1,I
20 Years					1,I
21 Years					

TABLE 3.14

Relative Cost Benefits Rankings for Age Comparisons Within Conservation Centers on Scale III Standard Cost Model

Overall Rankings	Program by Program Comparisons				
	17 Years	18 Years	19 Years	20 Years	21 Years
16 Years	0,0	0,0	0,0	0,0	0,0
17 Years		0,0	0,0	0,0	0,0
18 Years			0,0	0,0	0,0
19 Years				0,0	0,0
20 Years					0,0
21 Years					

TABLE 3.15

Relative Effectiveness Rankings for Age Comparisons Within Conservation Centers on Scale I Standard Cost Model

Overall Rankings	Program by Program Comparisons				
	19 Years	20 Years	18 Years	17 Years	16 Years
21 Years	2,IV	4,II	4,II	3,II	3,II
19 Years		4,II	4,II	4,II	4,II
20 Years			3,II	1,I	1,I
18 Years				1,I	2,IV
17 Years					2,IV
16 Years					

TABLE 3.16

Relative Effectiveness Rankings for Age Comparisons Within Conservation Centers on Scale II Standard Cost Model

Overall Rankings	Program by Program Comparisons				
	20 Years	19 Years	21 Years	17 Years	16 Years
18 Years	4,IV	4,II	3,II	1,I	1,I
20 Years		4,II	1,I	1,I	1,I
19 Years			1,I	1,I	1,I
21 Years				2,IV	2,II
17 Years					1,I
16 Years					

TABLE 3.17

Relative Cost Benefits Rankings for Age Comparisons Within All Centers on Scale I - Standard Cost Model

Overall Rankings	Program by Program Comparisons				
	17 Years	18 Years	19 Years	20 Years	21 Years
16 Years	4,II	4,II	4,II	4,II	4,II
17 Years		4,II	4,II	4,II	3,II
18 Years			4,II	2,II	1,I
19 Years				1,I	1,I
20 Years					1,I
21 Years					

TABLE 3.18

Relative Cost Benefits Rankings for Age Comparisons Within All Centers on Scale II--Standard Cost Model

Overall Rankings	Program by Program Comparisons				
	17 Years	18 Years	19 Years	20 Years	21 Years
16 Years	4,II	4,II	3,II	3,II	3,II
17 Years		3,II	3,II	3,II	3,II
18 Years			1,I	1,I	1,I
19 Years				1,I	1,I
20 Years					1,I
21 Years					

TABLE 3.19

Relative Cost Benefits Ranking for Agen Comparisons Within
Conservation Centers on Scale III Standard Cost Model

Overall Rankings	Program by Program Comparisons				
	17 years	18 years	19 years	20 years	21 years
16 years	0,0	0,0	0,0	0,0	0,0
17 years		0,0	0,0	0,0	0,0
18 years			0,0	0,0	0,0
19 years				0,0	0,0
20 years					0,0
21 years					

CITY SIZE COMPARISONS

Codes used in Tables 3.20 through 3.35 should be interpreted in the following manner:

(1) 2,500--rural area or under 2,500 population

(2) 50,000--population of 2,500 to 50,000

(3) 250,000--population of 50,000 to 250,000

(4) Large--population of over 250,000

TABLE 3.20

Relative Cost Benefits Rankings for City Size Comparisons Within Men's Centers on Scale I- Standard Cost Model

Overall Rankings	Program by Program Comparisons		
	50,000	250,000	Large
2,500	1,I	1,I	1,I
50,000		1,I	2,IV
250,000			2,IV
Large			

TABLE 3.21

Relative Cost Benefits Rankings for City Size Comparisons Within Men's Centers on Scale II- Standard Cost Model

Overall Rankings	Program by Program Comparisons		
	50,000	250,000	Large
2,500	0,0	0,0	1,I
50,000		1,I	1,I
250,000			1,I
Large			

TABLE 3.22

Relative Cost Benefit Rankings for City Size Comparisons
Within Men's Centers on Scale III–Standard Cost Model

Overall Rankings	Program by Program Comparisons		
	50,000	250,000	Large
2,500	0,0	0,0	0,0
50,000		0,0	0,0
250,000			0,0
Large			

TABLE 3.23

Relative Effectiveness Rankings for City Size
Comparisons Within Centers on Scale I
Standard Cost Model

Overall Rankings	Program by Program Comparisons		
	Large	50,000	2,500
250,000	2,IV	1,I	1,I
Large		4,II	1,I
50,000			1,I
2,500			

TABLE 3.24

Relative Effectiveness Rankings for City Size Comparisons Within Men's Centers on Scale II Standard Cost Model

Overall Rankings	Program by Program Comparisons		
	50,000	Large	2,500
250,000	1,I	1,I	1,I
50,000		1,I	1,I
Large			1,I
2,500			

TABLE 3.25

Relative Cost Benefits Rankings for City Size Comparisons Within Women's Centers on Scale I - Standard Cost Model

Overall Rankings	Program by Program Comparisons		
	50,000	250,000	Large
2,500	1,I	1,I	1,I
50,000		2,II	1,I
250,000			3,II
Large			

TABLE 3.26

Relative Cost Benefits Rankings for City Size Comparisons Within Women's Centers on Scale II -Standard Cost Model

Overall Rankings	Program by Program Comparisons		
	50,000	Large	250,000
2,500	3,IV	2,II	1,I
50,000		3,II	1,I
Large			2,IV
250,000			

TABLE 3.27

Relative Cost Benefits Rankings for City Size Comparisons Within Women's Centers on Scale III - Standard Cost Model

Overall Rankings	Program by Program Comparisons		
	50,000	250,000	Large
2,500	0,0	0,0	0,0
50,000		0,0	0,0
250,000			0,0
Large			

TABLE 3.28

Relative Effectiveness Rankings for City Size Comparisons Within Women's Centers on Scale I- Standard Cost Model

Overall Rankings	Program by Program Comparisons		
	Large	2,500	50,000
250,000	3,IV	1,I	1,I
Large		2,II	2,II
2,500			2,IV
50,000			

TABLE 3.29

Relative Effectiveness Rankings for City Size Comparisons Within Women's Centers on Scale II-Standard Cost Model

Overall Rankings	Program by Program Comparisons		
	250,000	50,000	2,500
Large	2,IV	2,II	1,I
250,000		2,II	3,II
50,000			3,II
2,500			

TABLE 3.30

Relative Cost Benefits Rankings for City Size Comparisons Within Conservation Centers on Scale I - Standard Cost Model

Overall Rankings	Program by Program Comparisons		
	Large	250,000	50,000
2,500	2,IV	2,II	2,II
Large		4,II	4,II
250,000			4,II
50,000			

TABLE 3.31

Relative Cost Benefits Rankings for City Size Comparisons Within Conservation Centers on Scale II Standard Cost Model

Overall Rankings	Program by Program Comparisons		
	2,500	50,000	Large
250,000	4,II	3,II	1,I
2,500		3,II	2,IV
50,000			2,IV
Large			

TABLE 3.32

Relative Cost Benefits Rankings for City Size Comparisons Within Conservation Centers on Scale III -Standard Cost Model

Overall Rankings	Program by Program Comparisons		
	2,500	250,000	50,000
Large	0,0	0,0	0,0
2,500		0,0	0,0
250,000			0,0
50,000			

TABLE 3.33

Relative Effectiveness Rankings for City Size Comparisons Within Conservation Centers on Scale I Standard Cost Model

Overall Rankings	Program by Program Comparisons		
	2,500	250,000	Large
50,000	2,IV	2,II	2,IV
2,500		2,IV	2,IV
250,000			2,IV
Large			

TABLE 3.34

Relative Effectiveness Rankings for City Size
Comparisons Within Conservation Centers on Scale II
Standard Cost Model

Overall Rankings	Program by Program Comparisons		
	250,000	2,500	Large
50,000	2,IV	2,II	1,I
250,000		3,II	1,I
2,500			1,I
Large			

TABLE 3.35

Relative Effectiveness Rankings for
City Size Comparisons Within Conservation
Centers on Scale III Standard Cost Model

Overall Rankings	Program by Program Comparisons		
	2,500	50,000	Large
250,000	0,0	0,0	0,0
2,500		0,0	0,0
50,000			0,0
Large			

RACE

TABLE 3.36

TABLE 3.36

Relative Cost Benefits Comparisons for Racial Groups--Standard Cost Model

Conditions	Most Cost Beneficial	Least Cost Beneficial	Level
Men's Centers, Scale I	Negro	White	2,IV
Men's Centers, Scale II	White	Negro	4,II
Woman's Centers, Scale I	Negro	White	2,IV
Woman's Centers, Scale II	White	Negro	4,II
Conservation Centers, Scale II	Negro	White	3,IV
Conservation Centers, Scale I	Negro	White	2,IV
All Centers, Scale II	White	Negro	4,II
All Centers, Scale I	Negro	White	2,IV

RACE AND CITY SIZE

Codes used in Tables 3.37 through 3.44 should be interpreted in the following manner:

(1) City size as in Tables 3.20 through 3.35.

(2) Race: (B) Black
(W) White

TABLE 3.37

Relative Cost Benefits Rankings for Race by City Size Comparisons
Within Men's Centers on Scale I Standard Cost Model

Overall Rankings	Program by Program Comparisons						
	2,500(W)	50,000(B)	Large(B)	250,000(B)	50,000(W)	Large (W)	250,000 (W)
2,500 (B)	2,IV	1,I	1,I	1,I	2,IV	2,IV	2,IV
2,500 (W)		4,II	3,II	4,II	1,I	1,I	1,I
50,000 (B)			2,IV	1,I	2,IV	2,IV	2,IV
Large (B)				4,II	2,IV	2,IV	2,IV
250,000 (B)					2,IV	2,IV	2,IV
50,000 (W)						3,II	1,I
Large (W)							1,I
250,000 (W)							

TABLE 3.38

Relative Cost Benefits Rankings for Race by City Size Comparisons
Within Men's Centers on Scale II -Standard Cost Model

Overall Rankings	Program by Program Comparisons						
	2,500(B)	50,000(W)	50,000(B)	250,000(W)	250,000(B)	Large (W)	Large (B)
2,500 (W)	4,II	1,I	3,II	1,I	3,II	3,II	0,0
2,500 (B)		2,IV	1,I	2,IV	0,0	1,I	1,I
50,000 (W)			4,II	1,I	3,II	3,II	3,II
50,000 (B)				2,IV	1,I	1,I	2,II
250,000 (W)					4,II	4,II	3,II
250,000 (B)						2,IV	2,II
Large (W)							2,II
Large (B)							

TABLE 3.39

Relative Cost Benefits Rankings for Race by City Size Comparisons
Within Women's Centers on Scale I - Standard Cost Model

Overall Rankings	Program by Program Comparisons						
	Large (B)	2,500(B)	250,000(W)	50,000(B)	250,000(B)	50,000(W)	2,500(W)
Large (W)	4,II	4,II	2,IV	4,II	4,II	3,II	2,II
Large (B)		4,II	2,IV	4,II	4,II	2,IV	2,IV
2,500 (B)			2,IV	2,IV	2,IV	2,IV	2,IV
250,000 (W)				4,II	4,II	4,II	4,II
50,000 (B)				4,II	4,II	4,II	4,II
250,000 (B)					3,II	2,IV	2,IV
50,000 (W)						2,IV	2,IV
2,500 (W)							2,II

TABLE 3.40

Relative Cost Benefits Rankings for Race by City Size Comparisons
Within Women's Centers on Scale II--Standard Cost Model

Overall Rankings	Program by Program Comparisons						
	50,000(W)	Large(B)	250,000(B)	50,000(B)	2,500(B)	2,500(W)	250,000(W)
Large (W)	3,II	3,II	3,II	3,II	3,II	1,I	1,I
50,000 (W)		4,II	4,II	3,II	4,II	1,I	1,I
Large (B)			1,I	2,IV	3,II	2,IV	2,IV
250,000 (B)				2,IV	3,II	2,IV	2,IV
50,000 (B)					4,II	2,IV	2,IV
2,500 (B)						2,IV	2,IV
2,500 (W)							2,II
250,000 (W)							

TABLE 3.41

Relative Cost Benefits Rankings for Race by City Size Comparisons
Within Conservation Centers on Scale I–Standard Cost Model

Overall Rankings	Program by Program Comparisons						
	Large(B)	50,000(B)	250,000(B)	50,000(W)	250,000(W)	2,500(W)	Large(W)
2,500 (B)	2,IV	1,I	1,I	2,IV	2,IV	2,IV	1,I
Large (B)		4,II	4,II	3,II	3,II	2,IV	1,I
50,000 (B)			2,IV	2,IV	2,IV	2,IV	1,I
250,000 (B)				3,IV	3,IV	3,IV	1,I
50,000 (W)					2,IV	2,IV	1,I
250,000 (W)						2,IV	1,I
2,500 (W)							2,II
Large (W)							

TABLE 3.42

Relative Cost Benefits Rankings for Race by City Size Comparisons
Within Conservation Centers on Scale II–Standard Cost Model

Overall Rankings	Program by Program Comparisons						
	50,000(W)	2,500(B)	2,500(W)	50,000(W)	Large (B)	250,000(B)	Large (W)
250,000 (W)	4,II	4,II	3,II	3,II	3,II	3,II	1,I
50,000 (W)		3,IV	2,II	2,IV	3,II	2,II	1,I
2,500 (B)			3,IV	2,II	1,I	1,I	0,0
2,500 (W)				3,IV	3,II	3,IV	2,II
50,000 (W)					4,II	1,I	0,0
Large (B)						3,IV	1,I
250,000 (B)							1,I
Large (W)							

TABLE 3.43

Relative Cost Benefits Rankings for Race by City Size Comparisons
Within All Centers on Scale I–Standard Cost Model

Overall Rankings	Program by Program Comparisons						
	50,000(B)	Large(B)	250,000(B)	50,000(W)	Large(W)	250,000(W)	2,500(W)
2,500 (B)	1,I	2,IV	1,I	2,IV	2,IV	2,IV	1,I
50,000 (B)		2,IV	3,II	2,IV	2,IV	2,IV	2,Iv
Large (B)			4,II	2,IV	2,IV	2,IV	1,I
250,000 (B)				2,IV	2,IV	2,IV	2,IV
50,000 (W)					1,I	1,I	1,I
Large (W)						2,IV	1,I
250,000 (W)							1,I
2,500 (W)							

TABLE 3.44

Relative Cost Benefits Rankings for Race by City Size Comparisons
Within All Centers on Scale II–Standard Cost Model

Overall Rankings	Program by Program Comparisons						
	2,500(B)	250,000(W)	50,000(B)	250,000(B)	Large (B)	Large (W)	2,500 (W)
50,000 (W)	4,II	1,I	3,II	3,II	3,II	1,I	1,I
2,500 (B)		2,IV	1,I	3,II	1,I	1,I	1,I
250,000 (W)			4,II	4,II	4,II	3,II	1,I
50,000 (B)			4,II	4,II	4,II	1,I	1,I
250,000 (B)					2,IV	2,II	1,I
Large (B)						1,I	1,I
Large (W)							1,I
2,500 (W)							

REGIONS

Codes for Tables 3.45 through 3.51 may be interpreted in the following manner:

1—North-East Region
2—Mid-Atlantic Region
3—South-East Region
4—Great Lakes Region
5—South-West Region
6—North Central Region
7—Western Region

TABLE 3.45

Relative Cost Benefits Rankings for Region Comparisons Within Men's Centers on Scale I - Standard Cost Model

Overall Rankings	Program by Program Comparisons					
	Region 2	Region 3	Region 7	Region 4	Region 1	Region 5
Region 6	4,II	4,II	1,I	1,I	1,I	3,II
Region 2		4,II	2,IV	2,IV	1,I	1,I
Region 3			2,IV	2,IV	2,IV	1,I
Region 7				2,IV	2,II	3,II
Region 4					1,I	3,II
Region 1						4,II
Region 5						

TABLE 3.46

Relative Cost Benefits Rankings for Region Comparisons Within Men's Centers on Scale II - Standard Cost Model

Overall Rankings	Program by Program Comparisons					
	Region 3	Region 2	Region 4	Region 7	Region 5	Region 1
Region 6	4,II	4,II	1,I	0,0	3,II	1,I
Region 3		1,I	1,I	1,I	2,II	1,I
Region 2			2,IV	1,I	3,II	1,I
Region 4				4,II	4,II	1,I
Region 7					4,II	1,I
Region 5						2,IV
Region 1						

TABLE 3.47

Relative Cost Benefits Rankings for Region Comparisons Within Women's Centers on Scale I Standard Cost Model

Overall Rankings	Program by Program Comparisons					
	Region 3	Region 7	Region 5	Region 2	Region 4	Region 6
Region 1	3,II	2,II	3,II	3,II	1,I	1,I
Region 3		2,IV	3,II	3,IV	1,I	1,I
Region 7			4,II	4,II	1,I	1,I
Region 5				2,IV	2,IV	2,IV
Region 2					2,II	1,I
Region 4						3,II
Region 6						

TABLE 3.48

Relative Cost Benefits Rankings for Region Comparisons Within Women's Centers on Scale II Standard Cost Model

Overall Rankings	Program by Program Comparisons					
	Region 3	Region 5	Region 2	Region 7	Region 6	Region 4
Region 1	3,II	4,II	4,II	3,II	1,I	1,I
Region 3		4,II	4,II	2,II	1,I	1,I
Region 5			2,IV	2,IV	2,IV	2,IV
Region 2				2,IV	2,IV	2,IV
Region 7					1,I	1,I
Region 6						2,IV
Region 4						

TABLE 3.49

Relative Cost Benefits Rankings for Region Comparison Within Conservation Centers on Scale I–Standard Cost Model

Overall Rankings	Program by Program Comparisons					
	Region 4	Region 6	Region 5	Region 2	Region 3	Region 1
Region 7	4,II	2,II	2,II	3,II	2,II	2,II
Region 4		2,IV	2,IV	1,I	1,I	I,II
Region 6			3,II	4,II	3,II	2,II
Region 5				4,II	4,II	2,II
Region 2					3,IV	2,IV
Region 3						2,I
Region 1						

TABLE 3.50

Relative Cost Benefits Rankings for Region Comparisons Within Conservation Centers on Scale II - Standard Cost Model

Overall Rankings	Program by Program Comparisons					
	Region 4	Region 6	Region 5	Region 2	Region 3	Region 1
Region 7	4,II	1,I	4,II	2,II	1,I	1,I
Region 4		2,IV	4,II	1,I	1,I	1,I
Region 6			4,II	3,II	1,I	1,I
Region 5				3,II	0,0	1,I
Region 2					3,IV	1,I
Region 3						1,I
Region 1						

TABLE 3.51

Relative Cost Benefits Rankings for Region Comparisons Within All Centers on Scale II–Standard Cost Model

Overall Rankings	Program by Program Comparisons					
	Region 6	Region 3	Region 7	Region 4	Region 5	Region 1
Region 2	2,IV	2,IV	2,IV	2,IV	4,II	1,I
Region 6		4,II	4,II	1,I	4,II	1,I
Region 3			2,IV	2,IV	4,II	1,I
Region 7				2,IV	4,II	1,I
Region 4					4,II	3,II
Region 5						2,IV
Region 1						

PLACEMENT AGENCYS

Codes for Tables 3.52 through 3.57 may be interpreted in the following manner:

11–JCOS

12–Local Employment Service

13–Youth Opportunity Center (YOC)

TABLE 3.52

Relative Cost Benefits Rankings for Placing Agent Comparisons Within Men's Centers on Scale I –Standard Cost Model

Overall Rankings	Program by Program Comparisons			
	12	11	13	31
51	2,IV	1,I	1,I	3,II
12		4,II	4,II	3,II
11			2,IV	3,II
13				3,II
31				

TABLE 3.53

Relative Cost Benefits Rankings for Placing Agent Comparisons Within Men's Centers on Scale II–Stanard Cost Model

Overall Rankings	Program by Program Comparisons			
	31	11	13	12
51	3,II	1,I	1,I	1,I
31		2,IV	2,IV	2,IV
11			2,IV	1,I
13				1,I
12				

TABLE 3.54

Relative Cost Benefits Rankings for Placing Agent Comparisons Within Women's Centers on Scale I Standard Cost Model

Overall Rankings	Program by Program Comparisons			
	13	12	11	31
51	2,IV	2,IV	2,II	3,II
13		2,IV	4,II	3,II
12			4,II	3,II
11				3,II
31				

TABLE 3.55

Relative Cost Benefits Rankings for Placing Agent Comparisons Within Women's Centers on Scale II Standard Cost Model

Overall Rankings	Program by Program Comparisons			
	31	11	13	12
51	3,II	1,I	1,I	1,I
31		2,IV	2,IV	2,III
11			2,IV	1,I
13				1,I
12				

TABLE 3.56

Relative Cost Benefits Rankings for Placing Agent Comparisons Within Conservation Centers on Scale I Standard Cost Model

Overall Ranking	Program by Program Comparisons			
	12	13	11	31
51	2,IV	2,IV	1,I	3,II
12		3,II	4,II	4,II
13			4,II	4,II
11				4,II
31				

TABLE 3.57

Relative Cost Benefits Rankings for Placing Agent Comparisons Within Conservation Centers on Scale II Standard Cost Model

Overall Rankings	Program by Program Comparisons			
	11		31	12
51	1,I	1,I	3,II	1,I
11		2,IV	4,II	1,I
13			4,II	1,I
31				2,IV
12				

CENTER SIZE

Tables 3.58 through 3.61

TABLE 3.58

Relative Cost Benefits Rankings for Center Size Comparisons Within Men's Centers on Scale I–Standard Cost Model

Overall Rankings	Program by Program Comparisons	
	Small	Large
Medium	2, IV	1, I
Small		1, I
Large		

TABLE 3.59

Relative Cost Benefits Rankings for Center Size Comparisons Within Men's Centers on Scale II Standard Cost Model

Overall Rankings	Program by Program Comparisons	
	Small	Large
Medium	2, IV	0, 0
Small		0, 0
Large		

TABLE 3.60

Relative Cost Benefits Rankings for Center Size Comparisons Within Women's Centers on Scale I -Standard Cost Model

Overall Rankings	Program by Program Comparisons	
	Medium	Small
Large	3, IV	1, I
Medium		0, 0
Small		

TABLE 3.61

Relative Cost Benefits Rankings for Center Size Comparisons Within Women's Centers on Scale II -Standard Cost Model

Overall Rankings	Program by Program Comparisons	
	Large	Small
Medium	1, I	0, 0
Large		3, II
Small		

CENTER TYPE

Codes used in Tables 3.62 and 3.63 may be interpreted in the following manner:

INT–Interior

AG–Agriculture

SR–State Related

TABLE 3.62

Relative Effectiveness Rankings for Comparisons Within Conservation Centers Types on Scale I Standard Cost Model

Overall Rankings	Program by Program Comparisons	
	AG	SR
INT	2,IV	3,IV
AG		4,IV
SR		

TABLE 3.63

Relative Cost Benefits Rankings for Sponsor Comparisons Within Conservation Centers on Scale II Standard Cost Model

Overall Rankings	Program by Program Comparisons	
	INT	AG
SR	1,I	1,I
INT		2,II
AG		

SPONSORING AGENCY

Codes for Tables 3.64 through 3.69 may be interpreted in the following manner:

Center Types:

1–Agriculture
2–Interior
3–State Related
4–Women's Urban
5–Men's Urban
6–Environmental-Developmental
7–Reception Centers

TABLE 3.64

Relative Cost Benefits Rankings for Sponsor Comparisons Within Men's Centers on Scale I- Standard Cost Model

Overall Rankings	Program by Program Comparisons					
	4	1	5	3	2	6
7	2,IV	2,IV	3,II	0,0	1,I	0,0
4		2,IV	4,II	1,I	1,I	3,II
1			4,II	3,II	3,II	3,II
5				1,I	1,I	0,0
3					1,I	3,II
2						4,II
6						

TABLE 3.65

Relative Cost Benefits Rankings for Sponsor Comparisons Within Men's Centers on Scale II Standard Cost Model

Overall Rankings	Program by Program Comparisons					
	1	5	4	3	2	6
7	1,I	3,II	1,I	0,0	0,0	0,0
1		4,II	4,II	3,II	3,II	3,II
5			1,I	1,I	1,I	1,I
4				3,II	1,I	3,II
3					1,I	3,II
2						4,II
6						

TABLE 3.66

Relative Cost Benefits Rankings for Sponsor Comparisons Within Conservation Centers on Scale I- Standard Cost Model

Overall Rankings	Program by Program Comparisons					
	1	7	4	3	2	6
5	2,IV	4,II	3,II	1,I	1,I	1,I
1		4,II	4,II	3,II	1,I	1,I
7			2,IV	1,I	1,I	1,I
4				1,I	1,I	1,I
3					3,II	2,II
2						2,IV
6						

TABLE 3.67

Relative Cost Benefits Rankings for Sponsor Comparisons Within Conservation Centers on Scale II Standard Cost Model

Overall Rankings	Program by Program Comparisons					
	5	7	4	3	6	2
1	3,II	4,II	3,II	3,II	1,I	1,I
5		4,II	3,II	3,II	1,I	1,I
7			2,IV	1,I	1,I	1,I
4				0,0	1,I	1,I
3					1,I	1,I
6						3,II
2						

TABLE 3.68

Relative Cost Benefits Rankings for Sponsor Comparisons Within Conservation Centers on Scale I Standard Cost Model

Overall Rankings	Program by Program Comparisons					
	4	5	6	1	2	3
7	2,IV	2,IV	2,IV	2,IV	1,I	1,I
4		4,II	1,I	2,IV	1,I	1,I
5			2,IV	2,IV	1,I	1,I
6				3,IV	1,I	2,II
1					0,0	1,I
2						3,II
3						

TABLE 3.69

Relative Cost Benefits Rankings for Sponsor Comparisons Within Women's Centers on Scale II Standard Cost Model

Overall Ranking	Program by Program Comparisons					
	4	6	5	1	3	2
7	1,I	1,I	1,I	1,I	1,I	1,I
4		2,IV	2,IV	2,IV	1,I	1,I
6			3,IV	2,IV	1,I	1,I
5				2,IV	1,I	1,I
1					3,II	1,I
3						1,I
2						

MEN'S CENTERS

Tables 3.70 through 3.80

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TABLE 3.70

Relative Cost Benefits Rankings for All Men's Centers on Scale I- Standard Cost Model

Overall Rankings	Program by Program Comparisons				
	Kilmer	Clearfield	Atterbury	Gary	Parks
Breckinridge	3,II	2,IV	1,I	1,I	1,I
Kilmer		2,IV	1,I	1,I	1,I
Clearfield			4,II	4,II	1,I
Atterbury				4,II	1,I
Gary					1,I
Parks					

TABLE 3.71

Relative Cost Benefits Rankings for Men's Centers on Scale I Standard Cost Model $300 Set Up Costs

Overall Rankings	Program by Program Comparisons				
	Kilmer	Clearfield	Atterbury	Gary	Parks
Breckinridge	3,II	2,IV	1,I	3,II	1,I
Kilmer		2,IV	1,I	1,I	1,I
Clearfield			4,II	4.II	1,I
Atterbury				4,II	1,I
Gary					1,I
Parks					

TABLE 3.72

Relative Cost Benefits Rankings for Men's Centers on Scale I–Standard Cost Model– $1,000 Set Up Costs

Overall Rankings	Program by Program Comparisons				
	Kilmer	Clearfield	Atterbury	Gary	Parks
Breckinridge	3,II	2,IV	3,II	1,I	1,I
Kilmer		2,IV	3,II	1,I	1,I
Clearfield			4,II	4,II	1,I
Gary				2,IV	1,I
Atterbury					1,I
Parks					

TABLE 3.73

Relative Cost Benefit Analysis Rankings for All Men's Centers on Scale II Standard Cost Model

Overall Rankings	Program by Program Comparisons				
	Kilmer	Clearfield	Atterbury	Gary	Parks
Breckinridge	3,II	1,I	1,I	3,II	0,0
Kilmer		2,IV	2,II	3,II	1,I
Clearfield			3,II	4,II	0,0
Atterbury				4,II	1,I
Gary					1,I
Parks					

TABLE 3.74

Relative Cost Benefits Rankings for All Men's Centers
on Scale III Standard Cost Model

Overall Rankings	Program by Program Comparisons				
	Clearfield	Atterbury	Kilmer	Gary	Parks
Breckinridge	0,0	0,0	0,0	0,0	0,0
Clearfield		0,0	0,0	0,0	0,0
Atterbury			0,0	0,0	0,0
Kilmer				0,0	0,0
Gary					0,0
Parks					

TABLE 3.75

Relative Effectiveness Rankings for All Men's Centers
on Scale I Standard Cost Model

Overall Rankings	Program by Program Comparisons				
	Gary	Kilmer	Atterbury	Parks	Clearfield
Breckinridge	4,II	3,IV	1,I	1,I	1,I
Gary		2,IV	1,I	1,I	2,II
Kilmer			2,IV	2,IV	2,IV
Atterbury				2,IV	2,IV
Parks					2,IV
Clearfield					

TABLE 3.76

Relative Effectiveness Rankings Within All Men's Centers
on Scale II--Standard Cost Model

Overall Rankings	Program by Program Comparisons				
	Breckinridge	Kilmer	Clearfield	Atterbury	Parks
Gary	2,IV	1,I	1,I	1,I	1,I
Breckinridge		3,II	1,I	1,I	0,0
Kilmer			2,IV	2,II	1,I
Clearfield				3,II	0,0
Atterbury					1,I
Parks					

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TABLE 3.77

Relative Cost Benefits Rankings Within All Men's Centers
on Scale II - Standard Cost Model
Gary L.O.S. Set to 225 Days

Overall Rankings	Program by Program Comparisons				
	Kilmer	Clearfield	Gary	Atterbury	Parks
Breckinridge	3,II	1,I	3,II	1,I	0,0
Kilmer		2,IV	4,II	2,II	1,I
Clearfield			4,II	4,IV	0,0
Gary				2,IV	1,I
Atterbury					1,I
Parks					

TABLE 3.78

Relative Cost Benefits Rankings for All Men's Centers
on Scale II Standard Cost Model
Gary L.O.S. Set to 210 Days

Overall Rankings	Program by Program Comparisons				
	Kilmer	Gary	Clearfield	Atterbury	Parks
Breckinridge	3,II	3,II	1,I	1,I	0,0
Kilmer		4,II	2,IV	2,II	1,I
Gary			2,IV	2,IV	1,I
Clearfield				3,II	0,0
Atterbury					1,I
Parks					

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TABLE 3.79

Relative Cost Benefits Rankings for All Men's Centers
on Scale II–Standard Cost Model
Gary L.O.S. Set to 195 Days

Overall Rankings	Program by Program Comparisons				
	Gary	Kilmer	Clearfield	Atterbury	Parks
Breckinridge	4,II	3,II	1,I	1,I	0,0
Gary		2,IV	2,IV	2,IV	1,I
Kilmer			2,IV	2,II	1,I
Clearfield				3,II	0,0
Atterbury					1,I
Parks					

TABLE 3.80

Relative Cost Benefits Rankings for All Men's Centers
on Scale II–Standard Cost Model
Gary L.O.S. Set to 180 Days

Overall Rankings	Program by Program Comparisons				
	Breckinridge	Atterbury	Kilmer	Parks	Clearfield
Gary	2,IV	2,IV	2,IV	1,I	1,I
Breckinridge		1,I	3,II	0,0	1,I
Atterbury			4,II	1,I	1,I
Kilmer				2,II	2,II
Parks					2,IV
Clearfield					

WOMEN'S CENTERS

Tables 3.81 through 3.84

TABLE 3.81

Relative Cost Benefits Rankings for Women's Centers on Scale I–Standard Cost Model

Overall Rankings	Ton Point	Albuque	McKinney	Huntton	Poland Sp	Moses Lake	Omaha	Keystone	Clinton	Jer City	Excelap	Marquette	Charleston	Los Ang	St Louis	Guthrie	Cleveland
Nat YWCA	1,I	1,I	1,I	1,I	1,I	1,I	1,I	1,I	1,I	1,I	1,I	1,I	1,I	1,I	1,I	1,I	1,I
Ton Point		4,II	4,II	3,II	1,I	0,0	1,I	1,I	0,0	0,0	1,I	0,0	0.0	0,0	0,0	0,0	1.I
Albuque			3,II	1,I	1,I	1,I	1,I	1,I	1,I	1,I	1,I	0.0	1,I	0.0	1,I	1,I	1,I
McKinney				2,IV	2,IV	2,IV	2,IV	1,I	1,I	1,I	1,I	1,I	1,I	1,I	1,I	1,I	1,I
Huntton					2,IV	2,IV	2,IV	1,I	1,I	1,I	1,I	1,I	1,I	1,I	1,I	1,I	1,I
Poland Sp						1,I	2,IV	1,I	1,I	1,I	1,I	1,I	1,I	1,I	0,0	1,I	1,I
Moses Lake							2,IV	2,II	1,I	0,0	1,I	0,0	1,I	0,0	1,I	1,I	1,I
Omaha								3,II	4,II	4,II	3,II	3,II	3,II	3,II	3,II	3,II	1,I
Keystone									4,II	4,II	2,II	3,II	2,II	3,II	0,0	1,I	1,I
Clinton										4,II	1,I	0,0	1,I	1,I	1,I	1,I	1,I
Jer City											2,IV	1,I	2,IV	1,I	1,I	1,I	2,IV
Excelap												4,II	3,II	4,II	3,II	3,II	1,I
Marquette													2,IV	2,II	2,II	1,I	2,IV
Charleston														4,II	3,II	1,I	2,IV
Los Ang															2,II	1,I	2,IV
St Louis																3,IV	2,IV
Guthrie																	2,IV
Cleveland																	

Program by Program Comparisons

TABLE 3.82

Relative Cost Benefits Rankings for Women's Centers on Scale II–Standard Cost Model

Overall Rankings	Ton Point	McKinney	Keystone	Albuque	Huntton	Omaha	Jer City	Moses Lake	Poland Sp	Excelap	Clinton	Charlestn	St Louis	Los Ang	Cleveland	Guthrie	Marquette
Nat YMCA	1,I	1,I	1,I	1,I	1,I	1,I	1,I	1,I	1,I	1,I	1,I	1,I	1,I	1,I	1,I	1,I	1,I
Ton Point		4,II	4,II	3,II	1,I	0,0	1,I	1,I	0,0	1,I	0,0	0.0	0,0	0,0	0,0	0,0	1,I
McKinney			3,II	1,I	1,I	1,I	1,I	1,I	1,I	1,I	1,I	0,0	1,I	0 0	1,I	1,I	1,I
Keystone				2,IV	2,IV	2,IV	2,IV	1,I	1,I	1,I	1,I	1,1	1,I	1.I	1,I	1,I	1,I
Albuque					2,IV	2,IV	2,IV	1,I	1,I	1,I	1,I	1,I	1,I	1,I	1,I	1,I	1,I
Huntton						1,I	2,IV	1,I	1,I	1,I	1,I	1,I	1,I	1,I	0 0	1,I	1,I
Omaha							2,IV	2,II	1,I	0 0	1,I	0,0	1,I	0 0	1,I	1,I	1,I
Jersey City								3,II	4,II	4,II	3,II	3,II	3,II	3,II	3,II	3,II	1,I
Moses Lake									4,II	4,II	2,II	3,II	2,II	3,II	0,0	1,I	1,I
Poland Sp										4,II	1,I	0 0	1,I	1,I	1,I	1,I	1,I
Excelap											2,IV	1,I	2.IV	1,I	1.I	1,I	2,IV
Clinton												4,II	3,II	4,II	3,II	3,II	1,I
Charlestn													2,IV	2,II	2,II	1,I	2,IV
St Louis														4,II	3,II	1,I	2 IV
Los Ang															2,II	1,I	2,IV
Cleveland																3,IV	2,IV
Guthrie																	2.IV
Marquette																	

Program by Program Comparisons

TABLE 3.83

Relative Effectiveness Rankings for Women's Centers on Scale I–Standard Cost Model

Overall Rankings	Excelap	Poland Sp	Keystone	Los Ang	Charleston	Albuque	St. Louis	Omaha	Gutherie	Ton Point	McKinney	Clinton	Cleveland	Huntton	Marquette	Moses Lake	Jersey City
Nat YWCA	1,I	1,I	1,I	1,I	1,I	1,I	1,I	1,I	1,I	1,I	1 I	1.I	1,I	1,I	1.I	1,I	1,I
Excelap		2,IV	2,IV	2,IV	1,I	1,I	1,I	1,I	1,I	1,I	1 I	1.I	1,I	1.I	1.I	1,I	1,I
Poland Sp			3,IV	2,IV	1,I	1,I	1,I	1,I	1,I	1,I	1 I	1.I	1,I	1,I	1,I	1,I	1,I
Keystone				2,IV	1,I	1,I	1,I	1,I	1,I	1,I	1 I	1,I	1.I	1,I	1,I	1,I	1,I
Los Angeles					3,II	1,I	1,I	1,I	1,I	1,I	1 I	1,I	1,I	1,I	1.I	1,I	1,I
Charleston						2,IV	1,I	1,I	1,I	1,I	1 I	1.I	1,I	1.I	1.I	1,I	2,IV
Albuque							2,IV	2,II	2,IV	1,I	1 I	1.I	2,IV	1,I	2,II	1,I	2,IV
St. Louis								4,II	3,IV	3,II	4,II	1,I	3.II	3,II	2.IV	1,I	2,IV
Omaha									2,IV	2,IV	3,II	2.II	2,IV	1,I	2,IV	1,I	2,IV
Gutherie										4,IV	4,II	2 II	3.II	3,II	2.IV	1,I	2,IV
Ton Point											4,II	2.II	3.IV	3,II	2,IV	1.I	2,IV
McKinney												2.IV	2,IV	2.IV	2,IV	2,IV	2,IV
Clinton													4,IV	4.IV	2,IV	1.I	2,IV
Cleveland														3 IV	2,IV	2,IV	2.IV
Huntton															2,IV	2,IV	2,IV
Marquette																3,IV	3,IV
Moses Lake																	2.IV
Jersey City																	

Program by Program Comparisons

TABLE 3.84

Relative Effectiveness Rankings for Women's Centers on Scale II- Standard Cost Model

Overall Rankings	Keystone	Excelap	Los Ang	Charleston	McKinney	Poland Sp	Albuque	Omaha	St. Louis	Cleveland	Ton Point	Gutherie	Clinton	Huntton	Jersey City	Moses Lake	Marquette
Nat. YWCA	1,I	1,I	1,I	1,I	1,I	1,I	1,I	1,I	1,I	1,I	1,I	1 I	1,I	1.I	1,I	1,I	1,I
Keystone		2,IV	1,I	1,I	1,I	1,I	1,I	1,I	1,I	1,I	1,I	1,I	1.I	1,I	1,I	1,I	1,I
Excelap			1,I	1,I	1,I	1,I	1.I	1,I	1.I	1,I	1.I	1.I	1,I	1.I	1,I	1,I	1,I
Los Angeles				3,IV	2,II	2,IV	1,I	1,I	1,I	2,II	1.I	1.I	1.I	1.I	1,I	1,I	1,I
Charleston					2,II	1,I	1,I	1,I	1,I	2,II	1.I	1.I	1,I	1.I	1,I	1,I	2.IV
McKinney						2,IV	2,II	2.IV	2,IV	2,II	2,IV	2,IV	2.IV	1.I	1,I	1,I	1,I
Poland Sp							4,II	3,II	2,II	2,II	2.II	2.II	1.I	1,I	1,I	1,I	2,IV
Albuque								2.IV	2,IV	2,IV	2,IV	2.IV	2.IV	1,I	1,I	1,I	1,I
Omaha									2,IV	2,II	2,II	2.IV	2,IV	1,I	1,I	1,I	1,I
St. Louis										4,II	4,II	4.II	1.I	3,II	2,II	1,I	1,I
Cleveland											3,IV	3,IV	2,IV	3,II	2,IV	1,I	2,IV
Ton Point												4,II	2.IV	3,II	2,II	1,I	2,IV
Gutherie													2.IV	3,II	2,II	1,I	2,IV
Clinton														4,II	2,II	1,I	1,I
Huntton															2,IV	1,I	2,IV
Jersey City																3,II	2,IV
Moses Lake																	2,IV
Marquette																	

Program by Program Comparisons

Appendix

INTERPRETATION OF TABLES

The discussion which follows is a portion of the Discussion of Results, Section IV, Volume I. It has been duplicated here to facilitate the analysis of the tables in Section III.

It is presented below without modification:

An analysis of the six men's centers using the cost benefits model produces the ranking of the programs which is included in Table 4.1.

TABLE 4.1

Relative Cost Benefits Rankings for Men's Center Programs
Using Scale I.–Standard Cost Model

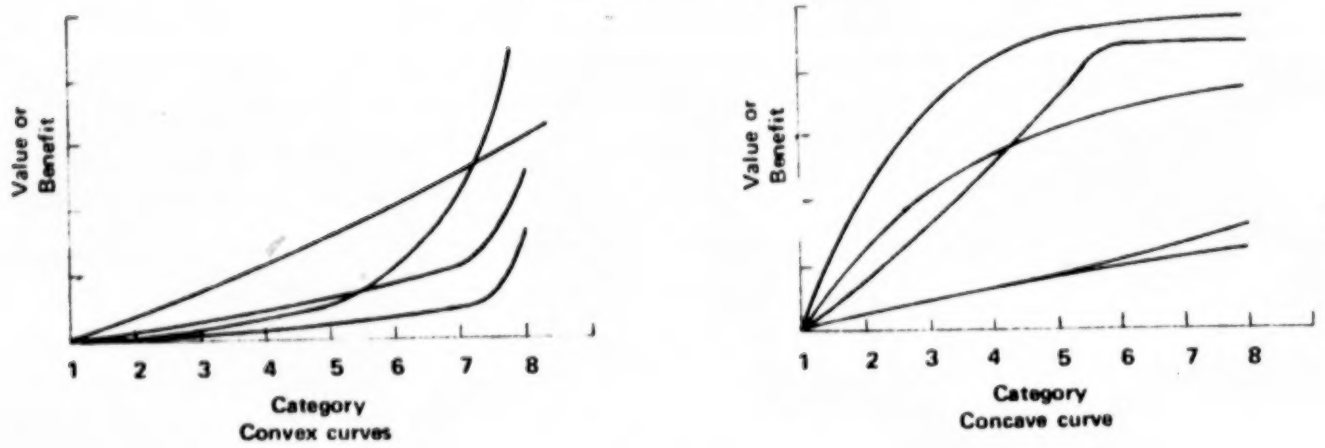
Overall Rankings		Program by Program Comparison				
RANK	PROGRAM	KILMER	CLEARFIELD	ATTERBURY	GARY	PARKS
1	Breckinridge	3,II	2,IV	1,I	1,I	1,I
2	Kilmer		2,IV	1,I	1,I	1,I
3.	Clearfield			4,II	1,I	1,I
4	Atterbury				4,II	1,I
5	Gary					1,I
6	Parks					

In the above table the arabic numbers represent levels of assumption under convex conditions. Roman numbers represent assumptions under concave conditions. The cell entry is the level at which the program in column one is determined to be more cost beneficial than the program heading the other columns.

Column one in Table I represents the relative rank of the six programs. The numbers (arabic and roman) in the other columns of the table represent the level of assumption which must be made for any given center to outrank another. The arabic number pertains to convex assumptions concerning the benefits curve. The roman number represents concave assumptions. A further explanation of these assumptions follows.

Exhibit 4.1

Examples of Convex and Concave Benefits Curves



An interpretation of the table shows Breckinridge to be the most cost beneficial men's center and Parks, the least cost beneficial. In between, the other centers rank as indicated on the left: Kilmer is second; Clearfield is third; and so on. This ranking is based on Scale I and the standard cost model.

Reading the rest of the table is a little more difficult due to the concepts involved. But it is the numbers which contain most of the important information concerning the rankings. The discussion of the model in Section II of this report gives considerable attention to the nature of the benefits curve. That is, if one were going to assign values to the outcome categories described by the scale, how should the values be assigned? The numbers in the table tell the reader how the values would have to be assigned if the cost benefit ranking is going to be accepted.

The meaning of the numbers, in light of the Table 4.1 discussion, is summarized below.

A. The number zero is the most powerful case. It is seldom seen, but if seen, it means that it is not possible to reach any other decision concerning the ranking, no matter what set of values are chosen for the categories. They can be scored best to worst; worst to best; high in the middle, low at either end -anything goes.

B. The number one, arabic or roman, in practical applications, is almost as powerful as zero. It requires only that the benefits curves, values assigned to the categories, are ordinal. That is, being a member of category eight is more valuable (beneficial) than being a member of category seven by some amount, small or large; and similarly, category seven has more value associated with it than category six; six beats five; and so on. (Note: it is all right for one or two groups to have the same value, so long as the values are not decreasing ones.)

C. The number two is slightly more restrictive than one. In the case of the number one, the shape of the benefits curve is completely irrelevant. The values simply increase from lowest to highest across categories. That the curve is convex (opening upward) or concave (opening downward) does not matter.

Specifically, level two assumptions require the user to determine whether most of the corpsmembers' benefits are greatest in the first few categories or in the upper categories. When are benefits gained from the program. For Scale I, which is heavily affected by length of stay, the question reduces to whether or not a corpsman benefits most from his early days in the program or from his later days in skill training.

D. Level three is only slightly more restrictive than level two. It simply says that the shape of the curve is important as in level two, but in addition there must be some perceptible gain for every category. Level two permits one or two categories to have the same value an almost meaningless restriction in the case of a complex training program like Job Corps.

E. Level IV is the most restrictive case considered by the model. To accept a cost benefits ranking at this level means that the reader must assume that the benefits curve is linear (represented by a straight line which passes through the origin.) The latter simply means that the first outcome corresponds to a failure condition with no associated benefit. Such a set of values for 8 categories might be:

(0, 1, 2, 3, 4, 5, 6, 7)

or

(0, 10, 20, 30, 40, 50, 60, 70)

or

(0, 153, 306, 459, 612, 765, 918, 1071)

Returning to the results in Table 4.1:

TABLE 4.1

Relative Cost Benefits Rankings for Men's Center Programs
Using Scale I. Standard Cost Model

Overall Rankings		Program by Program Comparison				
RANK	PROGRAM	KILMER	CLEARFIELD	ATTERBURY	GARY	PARKS
1	Breckinridge	3,II	2,IV	1,I	1,I	1,I
2	Kilmer		2,IV	1,I	1,I	1,I
3	Clearfield			4,II	1,I	1,I
4	Atterbury				4,II	1,I
5	Gary					1,I
6	Parks					

Column one represents the overall ranking of programs. The arabic and roman numbers represent the level of assumption necessary to accept a given comparison between programs. As the numbers increase, the power of the comparison decreases. It is not possible, however, for the rankings to be reversed. Rather, the user may choose not to accept the assumptions necessary and assume no relative program difference.

Consider:

Breckinridge is determined more cost beneficial than Atterbury, Gary and Parks at level one. This means that no matter what set of ordinal values the user chooses to assign to the outcome categories, Breckinridge remains the most cost beneficial. It does not matter whether one argues that most of the benefits are obtained early in the program or conversely, if one argues that the greatest value is attained late in the program. This is an exceptionally strong position.

Breckinridge is determined more ost beneficial than Kilmer at level three under convex assumptions and at level two under concave assumptions. The fact that the model requires this level of assumption indicates a greater degree of closeness than in the case of the above described three centers (Kilmer is also more cost beneficial than Atterbury, Gary, and Parks at level one.) Yet, Breckinridge remains significantly in position since the

model requires only that the values continue to increase if the convex case (greater worth later) is accepted, and that if the concave case is accepted, the increase to be regular and steady, with no two categories having the same value. Any of a very large set of benefits curves will satisfy these assumptions.

For example:

In the convex case, Breckinridge would beat Kilmer cost benefits wise if the values assigned to the eight categories were either:

(0, 1, 2, 3, 4, 5, 6, 7)

or

(0, 1, 4, 9, 16, 25, 36, 49)

or

(0, 2, 6, 12, 20, 30, 42, 56)

In the concave case, either of the following sets of values would satisfy the conditions:

(0, 10, 15, 15, 16, 17, 18, 19, 10)

or

(0, 1000, 1500, 2000, 2100, 2102, 2103, 2103)

In four cases a linear assumption is necessary for program by program comparisons to be made. It will be seen later (during discussion of cost models) that even this most restrictive case is a relatively strong position, and that comparisons which require level four may still be quite significant.

In summary, Table 4.1 indicates that Breckinridge is the most cost beneficial program of the six examined and further, that Breckinridge and Kilmer emphatically beat Atterbury, Gary, and Parks in the rankings. Further, as might be expected, it typically requires a higher level assumption for a program to be determined more cost beneficial than the next in line, than it does for those further down the rankings. Parks proves least beneficial and, significantly, is bested by all programs at level one on this scale.